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V.15 #174

June 1961

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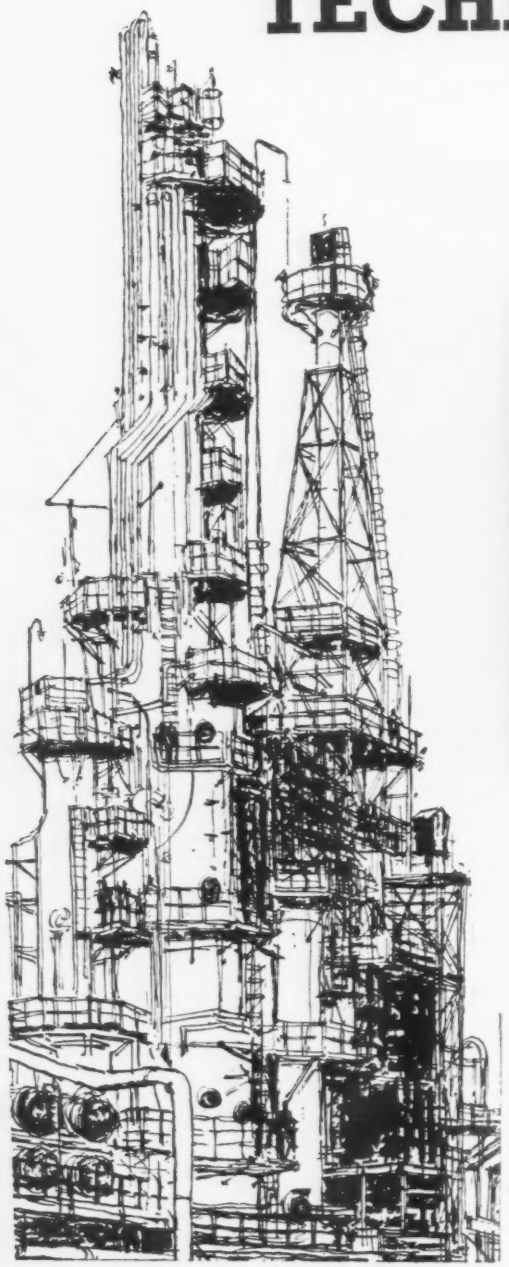

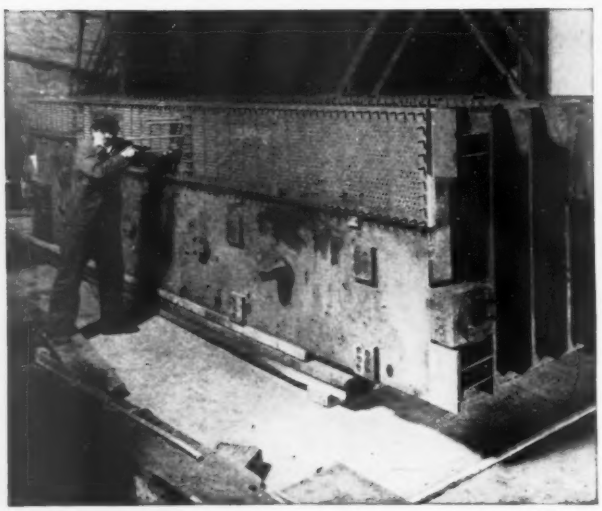

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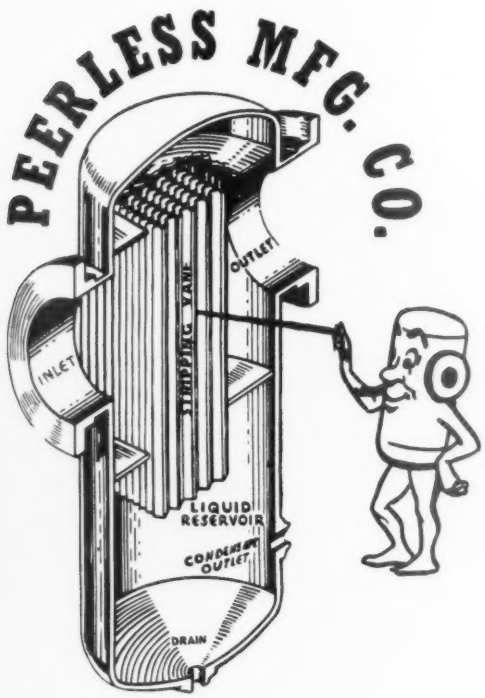

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61 *New Cavendish Street, London, W.*1
Telephone LANgham 3583-4-5

Vol. 15, No. 174 **June 1961**

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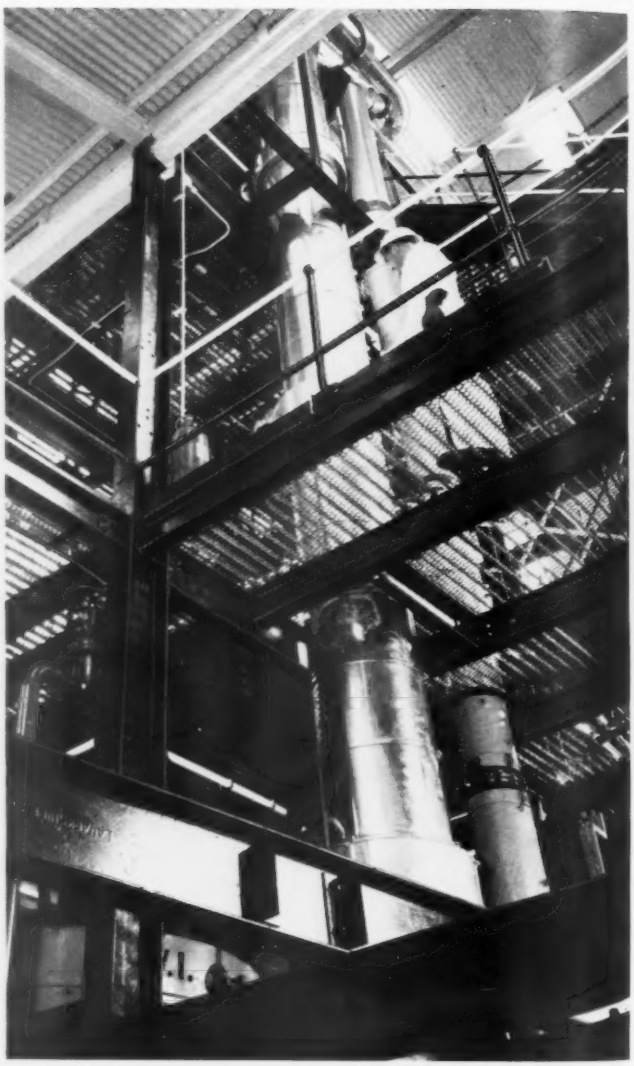

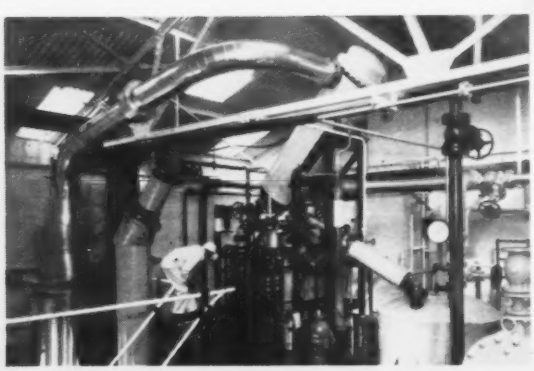

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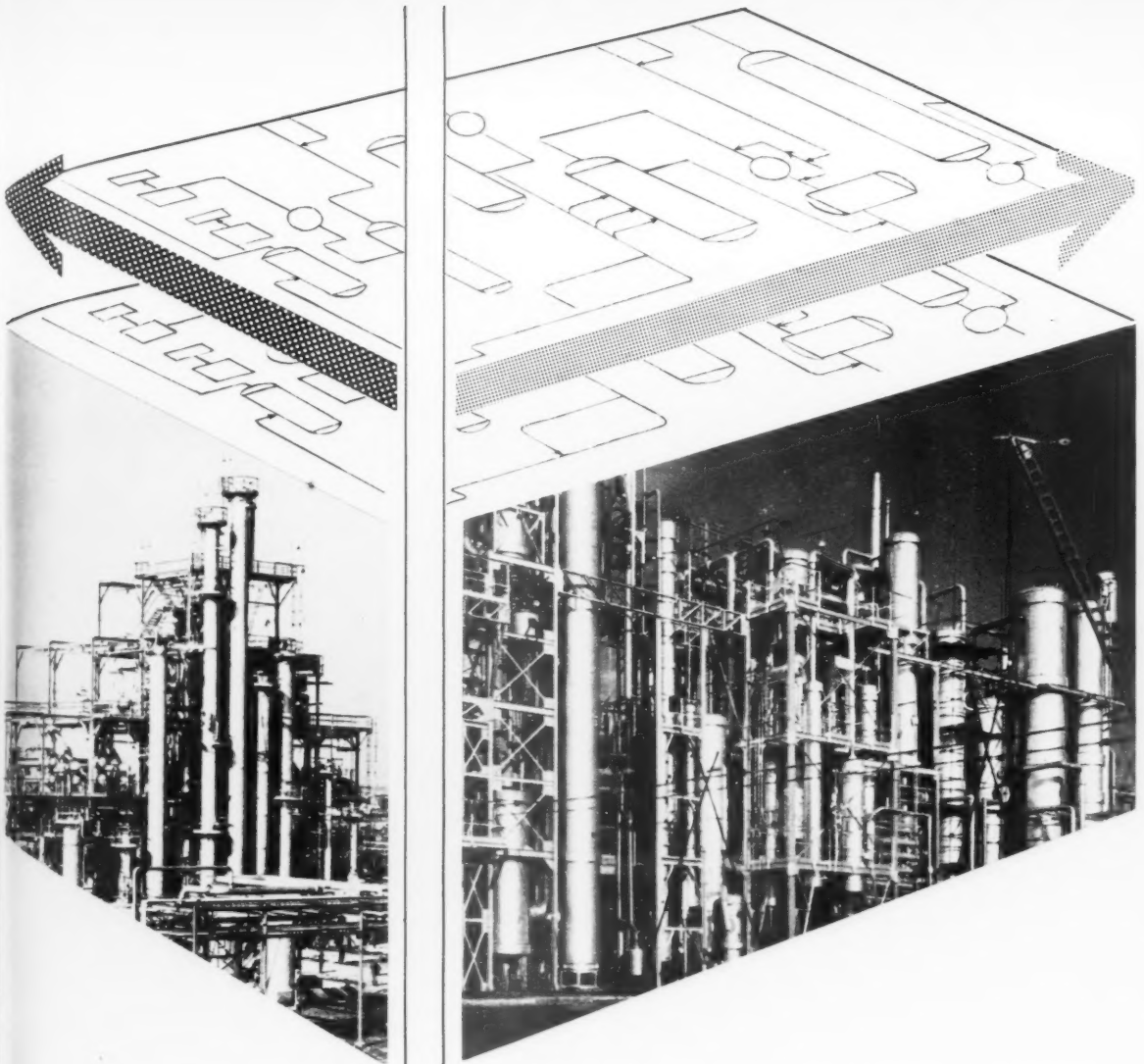

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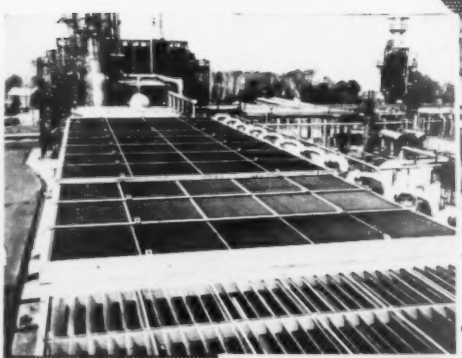

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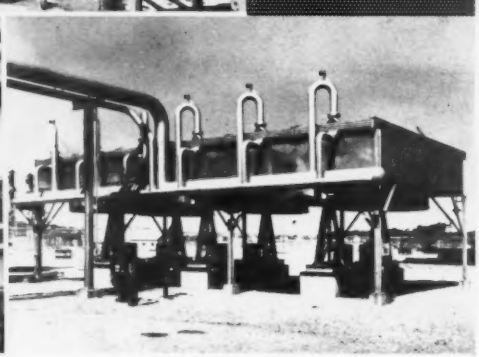

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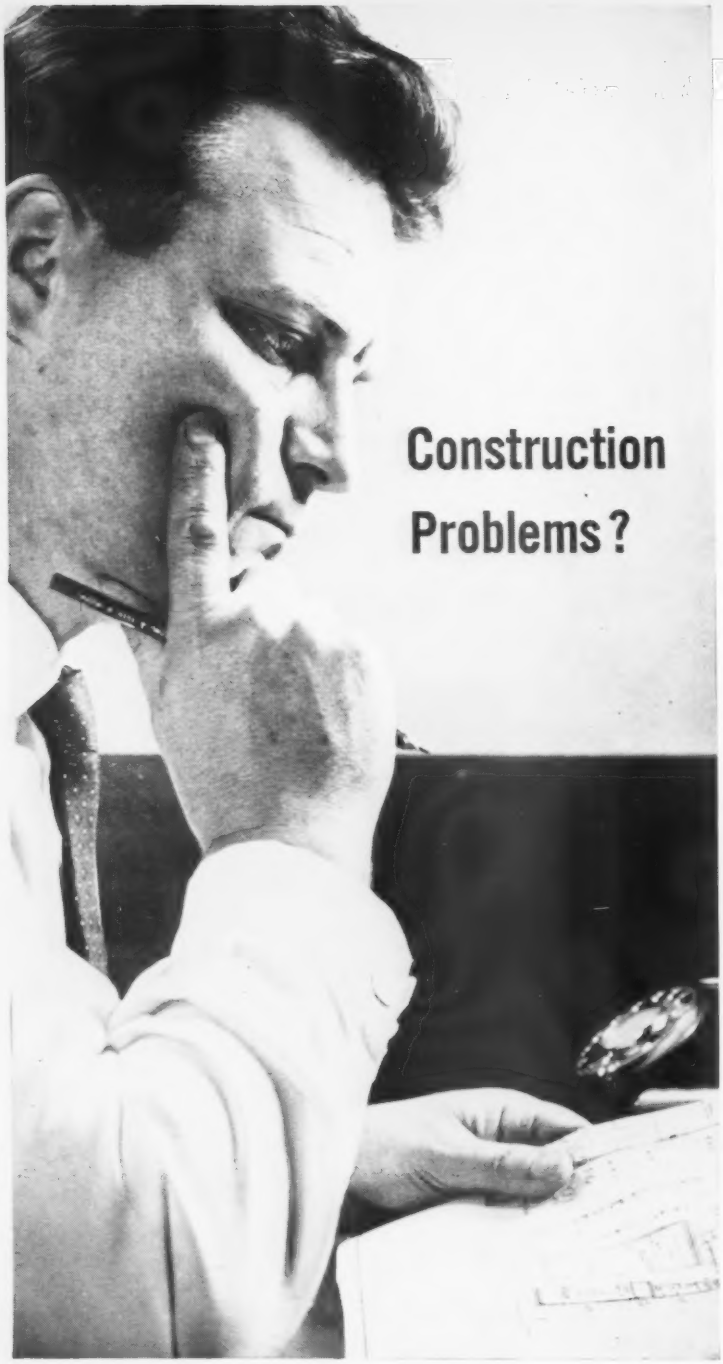

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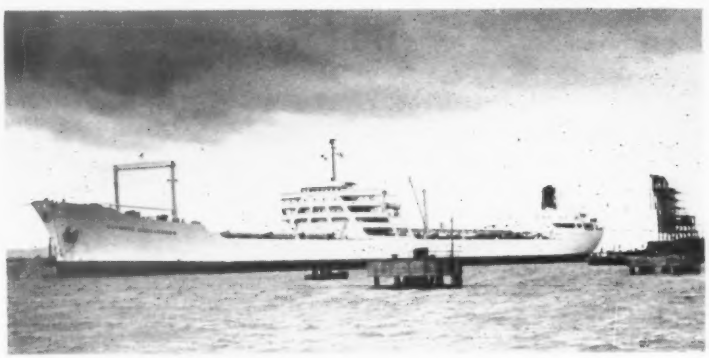

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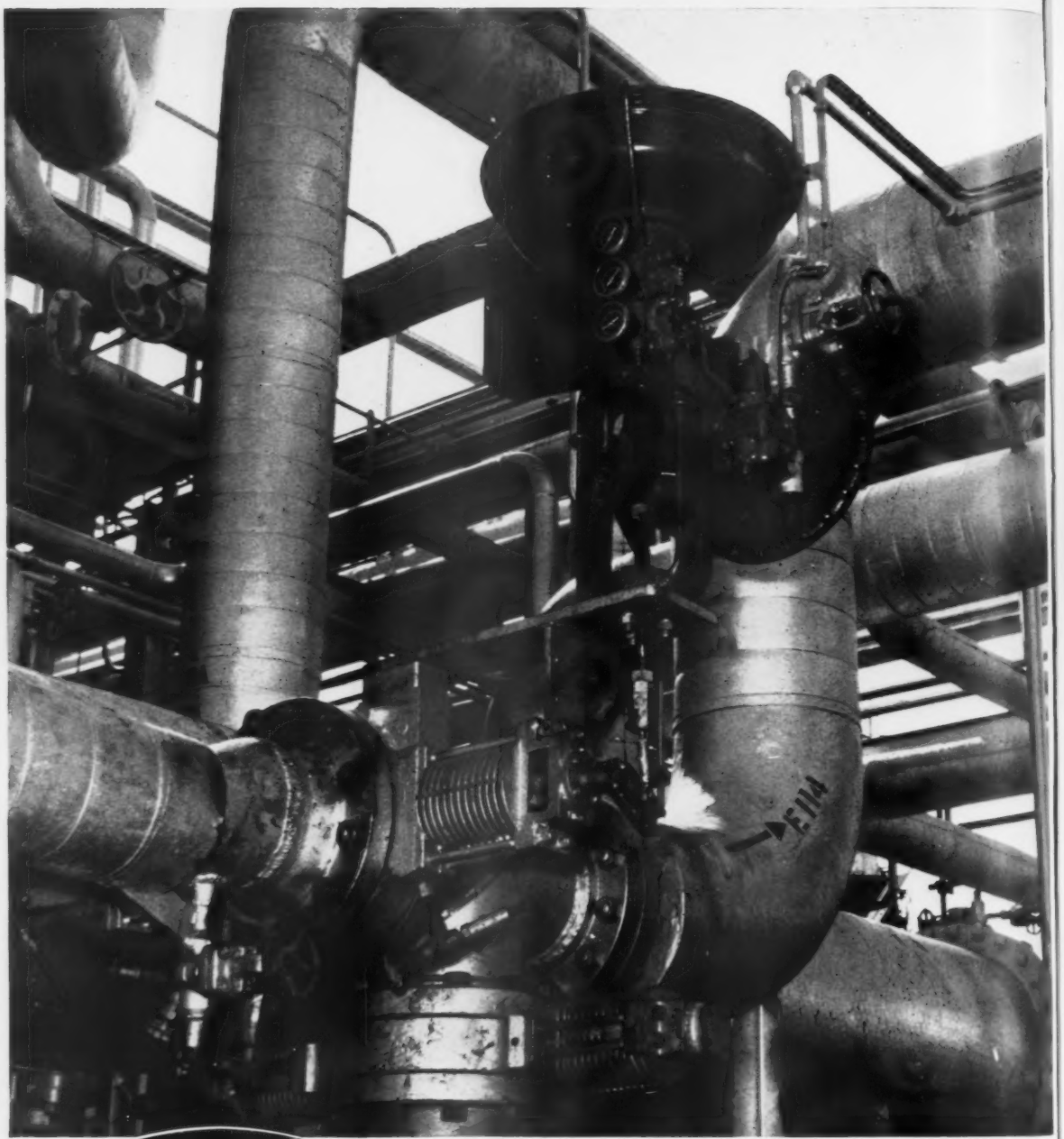

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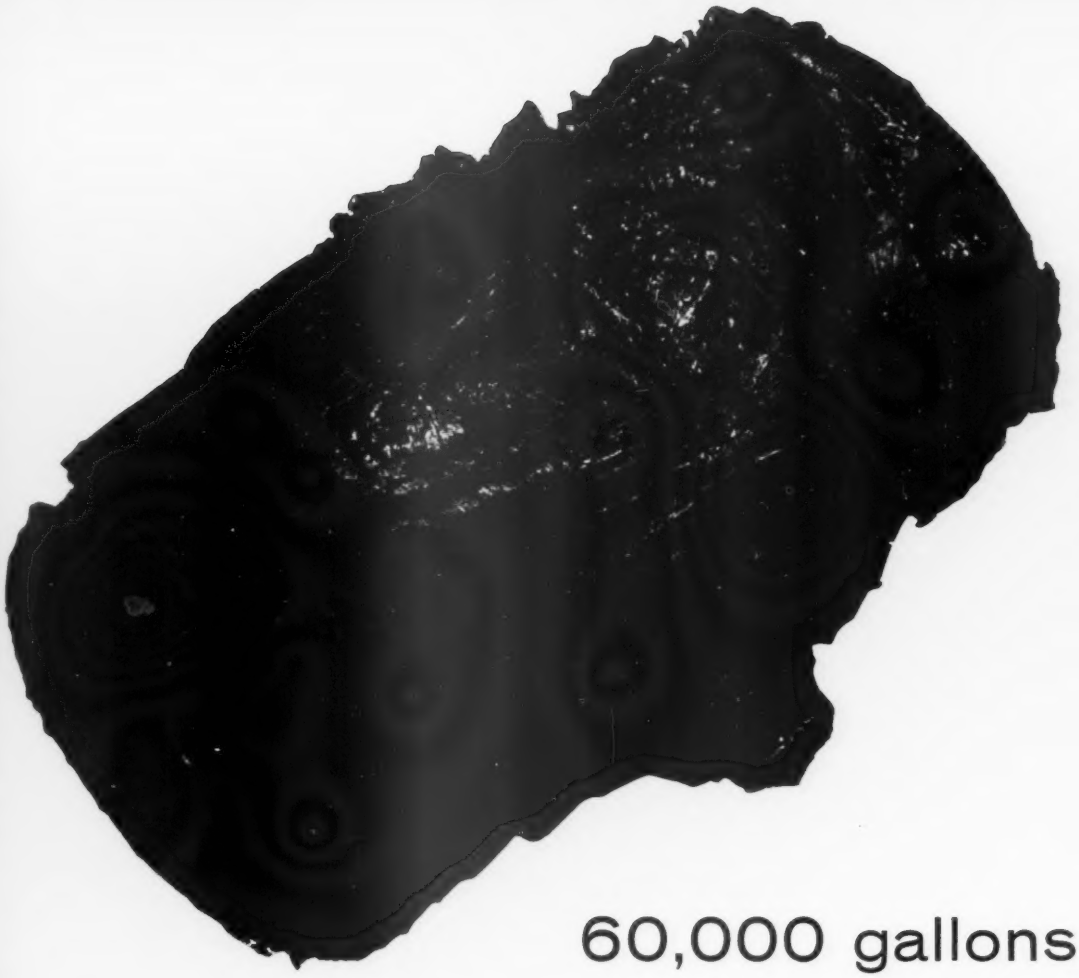

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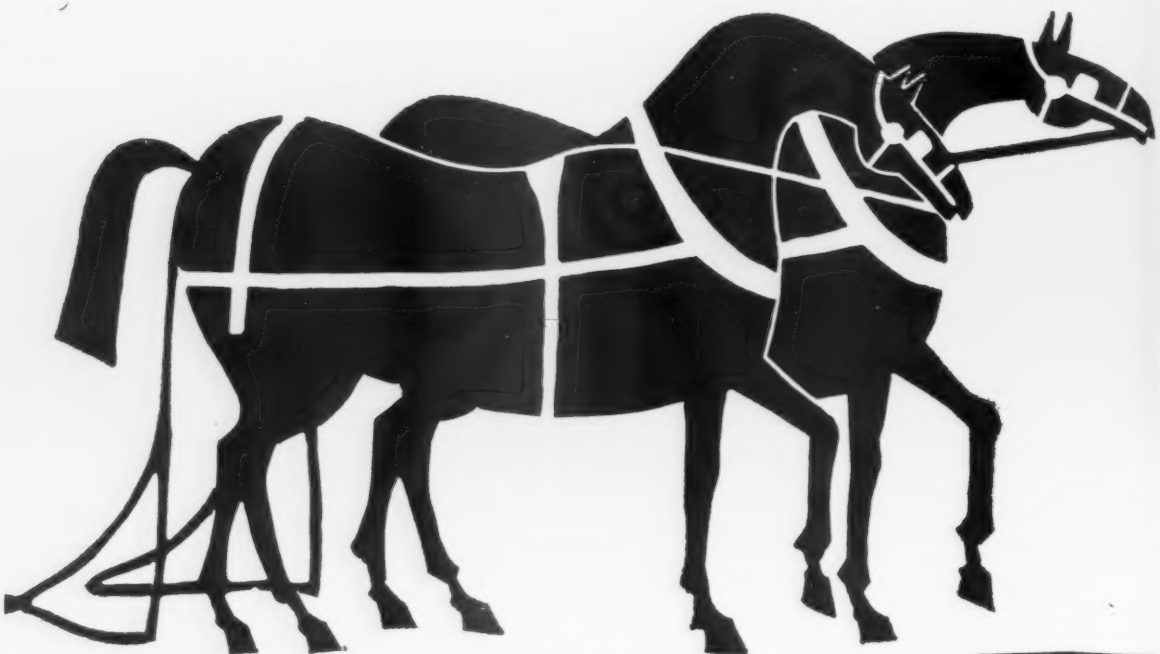

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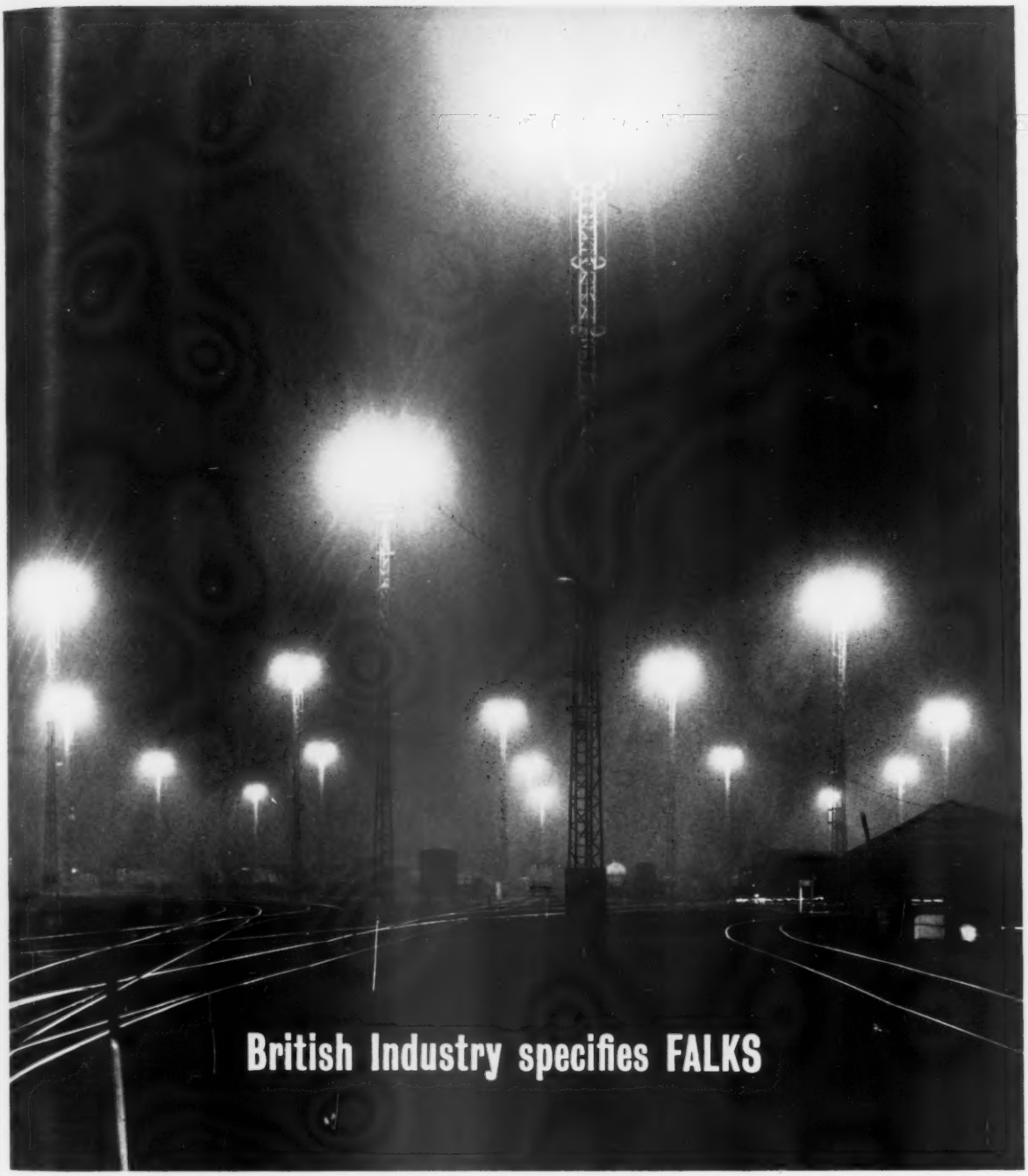

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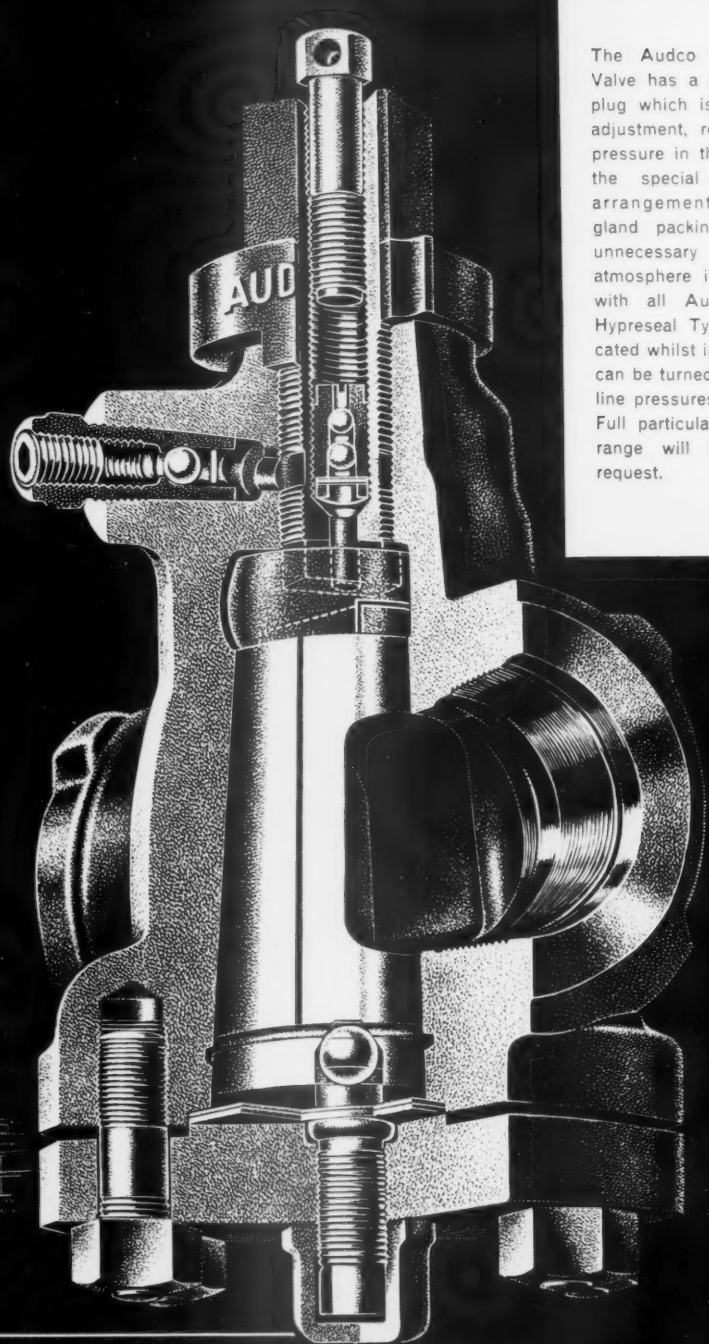

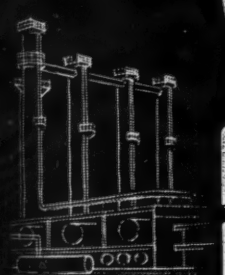

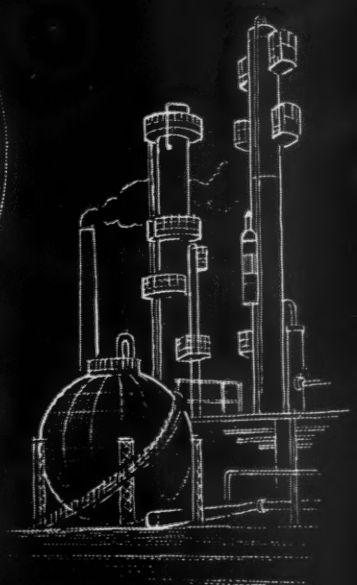

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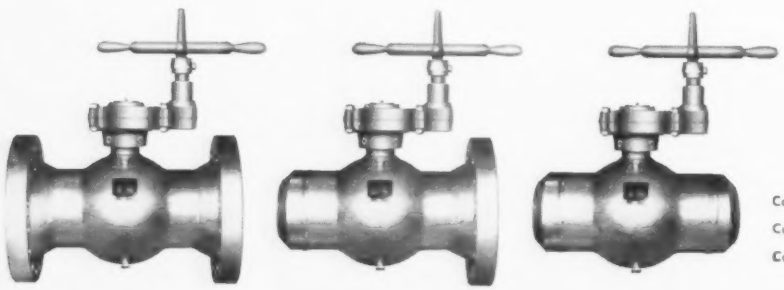

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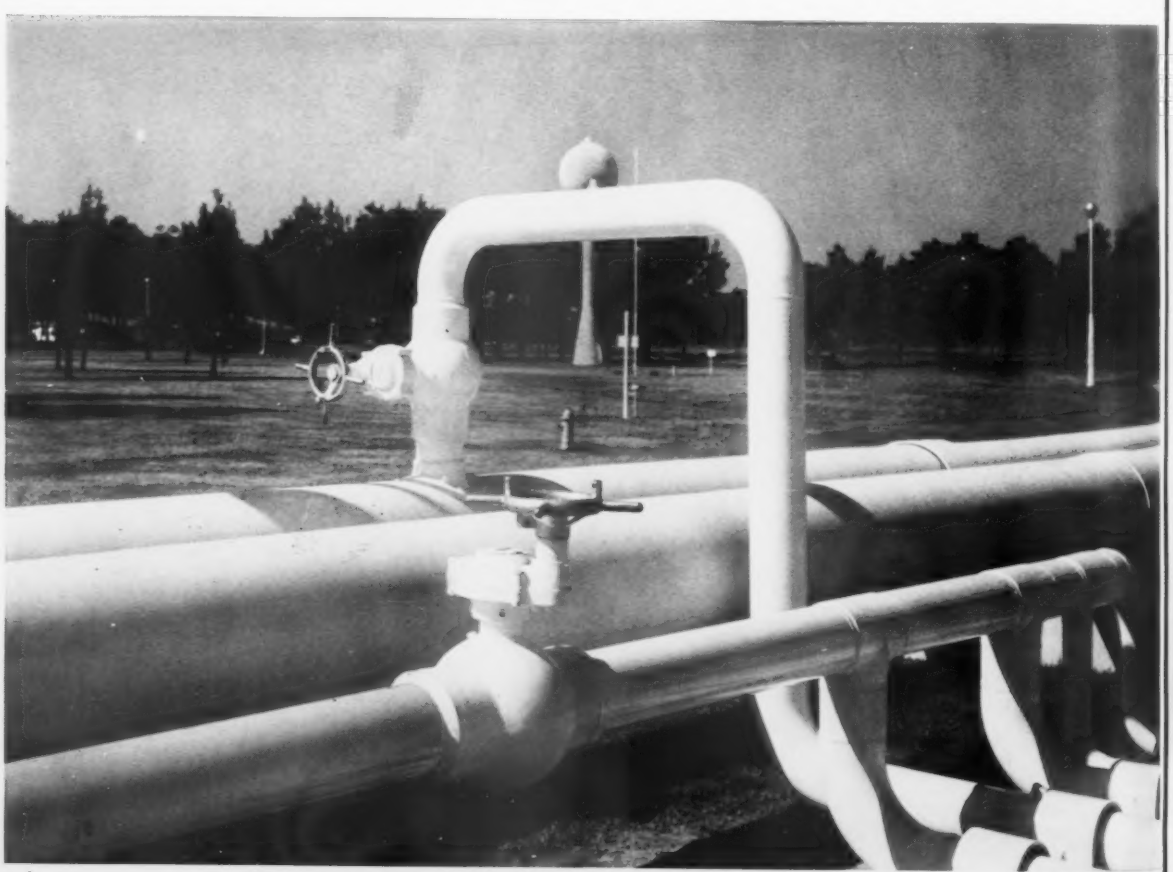

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Volume 15, No. 174 June 1961

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*Reactive Fuels and Chemicals from Coal**

By C. E. NEEDHAM†

Being a relative term, the description "reactive" needs some kind of yardstick to enable comparisons to be made. Since coal is still by far the most popular solid fuel in the home, it is natural to take the reactivity of coal as the standard against which to compare the reactivity of other solid fuels. A domestic fuel can be described as reactive if it is able to match up to coal with regard to ease of ignition and rate of pick-up to a satisfactory fire—properties which might be considered analogous to the cold-start and acceleration characteristics of certain liquid fuels.

By heating coal to no more than about 600°C, which is about half as high as the temperature employed to produce coke in gas works retorts and coke-ovens, it is possible to produce a smokeless fuel which retains the reactivity of coal and is therefore capable of replacing coal satisfactorily in all types of domestic appliances, including the extremely simple stool-bottom and fret which is still used to heat the majority of British homes.

The fact that these "low temperature" fuels are so reactive is particularly important for the smoke control areas which are being introduced as a result of the Clean Air Act of 1956; it enables these fuels to replace coal in a smoke control area without the need to install the more costly appliances which have been designed specifically to enable the less reactive high temperature cokes to be burned in the home.

In addition to the differences in reactivity between the solid fuels produced by low and high temperature carbonizing systems, the tars or oils recovered from the distillation gases from the two systems are widely different in composition and properties.

*Presented to the IP Stanlow Branch on 16 December 1959.

†Coalite and Chemical Products Ltd.

Reactivity

It may be of interest to describe very briefly how the reactivity of solid fuels—their "octane-rating", so to speak—is determined in the laboratory, and to show how laboratory reactivity indices are related to the performance of a fuel on the open fire at home.

The Critical Air Blast (CAB) apparatus, illustrated in Fig 1, is widely used for the laboratory determination of reactivity.

A crushed and graded sample of the fuel to be tested is charged into the silica combustion tube D, which has a specified volume. The surface of the fuel is ignited by means of the electric heater C, which is controlled at a fixed thermal output.

Critical Air Blast Apparatus

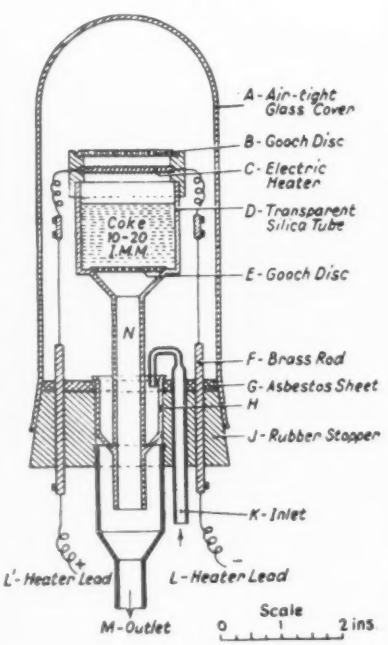


Fig 1

Air is pumped into the apparatus at different measured rates until, by trial and error, that minimum rate of air flow is found which will just maintain steady combustion in the fuel-bed over a prolonged period. A fresh fuel sample is introduced to the apparatus each time that the air flow rate is altered.

This measured minimum air flow, expressed in cu ft/min, is the CAB value, or reactivity index; the greater the air-flow required, the lower is the reactivity of the fuel. Typical CAB values for various smokeless fuels are shown in Table I.

TABLE I

Charcoal	0·003 cu ft/min
Coalite	0·018 ,,
Rexco	0·026 ,,
Anthracite	0·035 ,,
Gas coke ...	0·050 to 0·065 ,,
Coke oven coke	0·060 to 0·075 ,,

No figures can be given for coal, since the apparatus is, unfortunately, incapable of dealing with the volatile

The quadrant radiometer developed by the British Coal Utilization Research Association

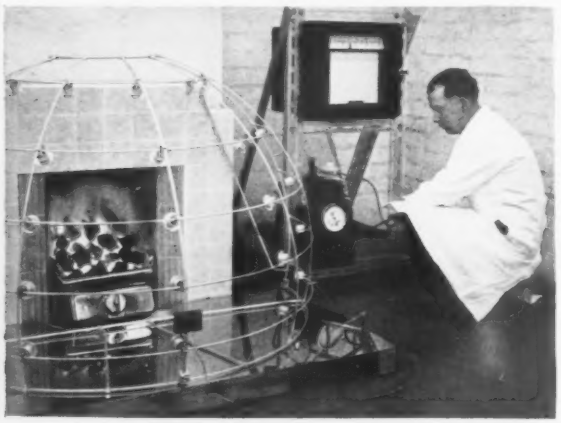


Fig 2

matter which is distilled from coal during the early stages of combustion.

Reactivity is related to the amount of volatile matter left in the fuel. Whereas *Coalite* contains 10 to 12 per cent of volatile matter, high temperature cokes generally have a volatiles content of less than 2 per cent.

The reactivity of a fuel can also be assessed by full-scale fire tests on an ordinary open grate in a carefully standardized setting. Measurements are made of the quantity of gas required to ignite the fuel, the rate at which the fuel picks up to give a cheerful fire, and of the maximum heat output of which the fuel is capable.

Various types of radiometer have been devised for this purpose, one of which is illustrated in Fig 2.

It is the quadrant radiometer developed by the British Coal Utilization Research Association at Leatherhead, and it comprises 25 thermo-sensitive elements, coupled in series, so that the total radiant heat output at any given time can be read from a recording potentiometer.

For a smokeless fuel to ignite and pick up as readily as coal, it should show a CAB reactivity index of less than 0·030 cu ft min and, in the fire test, it should require no more than the equivalent of 3000 Btu of gas (about 6 cu ft of town gas) for ignition. It should reach a cheerful fire, with a radiant output of about 5000 Btu hr, in less than half an hour. A fuel capable of fulfilling these requirements would be generally accepted as reactive.

Fig 3 compares the initial radiation curves recorded during fire-tests on an unreactive high temperature coke and a reactive low temperature semi-coke. Whereas the semi-coke required only 3000 Btu of gas for ignition, the high temperature gas coke required 8000 Btu. The low temperature semi-coke produced a cheerful fire (5000 Btu hr) after half an hour, whereas this stage was reached only after two hours in the case of the gas coke, even though an inset coke-burning grate was used for the tests.

Brief History of Low Temperature Carbonization

It is not only of recent years that the smoke nuisance has aroused concern in London. There was a good deal of disquiet in this connexion about 60 years ago, when a group of people anxious to alleviate the smoke problem approached Thomas Parker—an engineer and, incidentally, the man who was awarded the first medal of the Smoke Abatement Society, or the Society for Clean Air as it now is.

Arising from this approach, Parker devised a process for heating coal at relatively low temperatures, of the order of 500 C, to produce a reactive smokeless fuel to replace coal for the purpose of domestic heating. Parker took out his patent for the process in 1906.

Twenty years elapsed, however, before Parker's process reached the commercial stage, which took the form of a plant at Barugh, near Barnsley, carbonizing of the order of 2000 tons of coal per week. In the meantime, Parker's idea had stirred quite a number of other people into devising processes along similar lines. Almost all of these processes ran into practical difficulties and never reached commercial fruition. In fact, there have been only two processes which have reached the stage of full-scale operation, both of which are operating very successfully and have expanded quite rapidly in the past decade. These are the *Coalite* and *Rexco* processes.

The "Coalite" Process

The process is operated by Coalite and Chemical Products Limited, and still has as its basis the essentials of Thomas Parker's original invention, particularly the retort. The Company operates two carbonizing works, one at Bolsover, near Chesterfield, and the other at Askern, near Doncaster, having a combined throughput of approximately 750,000 tons of coal per year.

The fact that this was the first process to be devised for the low temperature carbonization of coal, and yet has remained the most successful, is a reflection of Parker's genius and the doggedness of his followers in improving the carbonizing process itself and in developing refining processes and markets for the chemical products which can be produced from low temperature coal-oil.

The Retorts

The retort in which the coal is carbonized is a 2¼-ton casting, taking the form of a nest of 12 tubes. Whereas

Radiation curves recorded during fire-tests

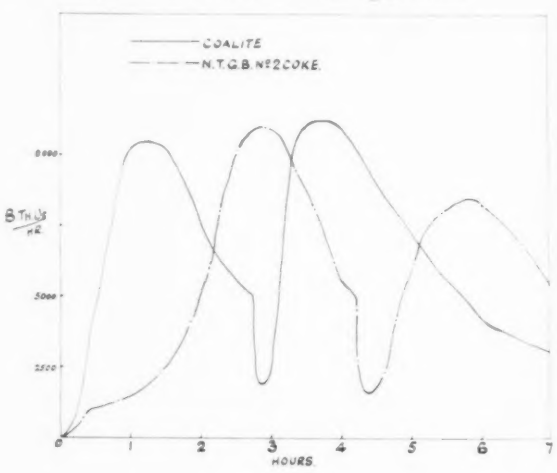


Fig 3

refractory materials such as silica are used for high temperature carbonization retorts and ovens, the *Coalite* retort is made of cast-iron to ensure a rapid rate of heat transfer to the coal.

The retort stands vertically, is 9 ft long, and the diameter of each of the twelve tubes increases from 4½ in at the top to 5¾ in at the bottom. Each tube holds a little more than ½ cwt of coal, giving the 12-tube retort a capacity of about 6½ cwts. It will be realized that the object of an increasing diameter from top to bottom of the retort tubes is to facilitate discharge of the *Coalite* after carbonization has been completed.

The retort is surmounted by a cast-iron retort head, in which the gases from the 12 separate tubes combine before being drawn away to the by-product recovery plant. The retort is closed from the atmosphere by a lid which sits in a water-seal at the top of the retort head.

Fig 4 shows a cross-section through a battery of retorts. The retorts are operated in pairs and below each pair is a common cooling chamber into which the *Coalite* falls on discharge from the retorts. The base of this cooling chamber is also sealed from atmosphere by water, and the *Coalite* is allowed to cool in there for about three and a half hours before being discharged and conveyed to the screening plant for grading into the various sizes suitable for open fires, domestic cookers, boilers, etc.

Cross-section through a battery of retorts

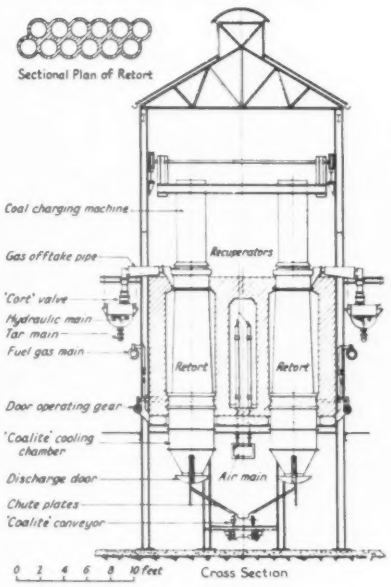


Fig 4

Roughly 90 per cent of the total *Coalite* produced appears as large grade for use on the open fire; another 5 per cent falls into the size grades suitable for domestic cookers, boilers, and stoves, whilst the remaining 5 per cent is breeze, or fines.

Forty of these 12-tube retorts make up a battery, and the works at Bolsover has 20 such batteries, giving a total throughput of about 10,000 tons of coal per week.

It might be asked why the coal is carbonized in a multitude of tubes rather than, for example, in rectangular slots. The reasons for this are:

(1) To achieve a high rate of heat conduction into the coal. The practical object is to achieve complete carbonization in the shortest possible time and, since individual tubes present a greater heating surface area than would be the case with a large rectangular chamber, the time required for carbonization is minimized.

(2) Circular retort tubes of about 5 in diameter produce a fuel of ideal size and minimize the quantity of fine "breeze" produced. *Coalite* from these circular tubes breaks naturally into pieces rather like slices cut from a cake: as a result, the product is ideally sized for domestic appliances without the need for any cutting or breaking—a process which is costly in itself and leads to the production of a good deal of fines having a very low market value.

The Coals Carbonized

The size of coal charged to the retorts is no larger than 1 in. Washed coals may come into the works from half a dozen different collieries, but they are all stored separately in elevated bunkers, so that they can ultimately be blended together in predetermined proportions to ensure consistent reactivity and strength in the resultant product.

The coals used for the process are relatively weakly caking smalls, of which there is an abundant supply, and which are not in great demand for the high temperature carbonizing systems employed at gas works and coke-ovens plant.

The Method of Heating the Retorts

Each cast-iron retort is set in a muffle chamber. At each side of the retort is a separate narrow combustion chamber in which coal-gas from the process is burned.

The amount of gas required to be burned in each combustion chamber is relatively small (about 450 cu ft/hr), but it is necessary that the flame be 9 ft long in order to ensure even heating from bottom to top of the retort. Any premixing of air and fuel gas, as in a bunsen burner or gas ring, would give too short a flame, so that combustion by diffusion is employed. Gas and air are fed separately to the combustion chamber through different ports, which are so spaced as to retard their mixing to the extent that combustion of the fuel gas is just completed before the combustion products leave the combustion chamber at retort-head level.

The metal retort itself does not come into direct contact with the combustion gases. Heat is transferred from the flame to a thin refractory panel wall which separates the retort from the combustion chamber, is conducted through this wall and passes thence to the retort itself, predominantly by radiation. This method of indirect heating in a muffle furnace has the advantages of prolonging the life of the retort and ensuring uniformity of the carbonizing conditions and, therefore, of the quality of the product.

Auxiliary Plant

The gases leaving the retorts pass into an hydraulic main, where some of the heavier vapours condense. The gas and lighter vapours are exhausted to the by-product recovery plant where condensers and electrostatic precipitators remove the remaining coal-oil from the gases. The gas is then passed through washers in which a suitable oil fraction is circulated to absorb the light hydrocarbons—the crude gas spirit—from the gas stream. The crude spirit is subsequently recovered from the absorbing oil by steam distillation.

The crude coal-oil, gas spirit, and aqueous liquor are eventually transferred to the central refinery at Bolsover for processing, as will be discussed later.

The stripped coal-gas passes to the gas-holders, whence it is drawn as required to heat the carbonizing retorts. The process is just about self-supporting for fuel gas.

Yields

From each ton of coal processed, the yields are:—

Coalite	14 to 15 cwts
Crude coal-oil	16·5 gallons
Crude gas spirit	3·5 gallons
Aqueous liquor	34·0 gallons
Gas	4000 cu ft at 700 Btu per cu ft

The "Rexco" Process

This system has been in operation since about 1937 and is now producing approximately 150,000 tons of smokeless fuel per year.

The retort is rather like a gas producer. It is cylindrical, 10 ft diameter by 25 ft high, and holds a charge of about 34 tons of coal. Low-temperature carbonization is effected by internal heating with a stream of hot gases. Fuel gas is burned inside the top of the retort and the hot combustion products are drawn downwards through the charge, heat transfer being achieved largely by convection.

When carbonization has been completed, in about eight hours, the fuel gas supply is cut but the recirculation of gases through the retort continues for a further five hours in order to cool the *Rexco* sufficiently to enable it to be discharged to atmosphere.

It is not practicable to use small coal for this process, and the coal used is generally within the size range 1 in to 5 in. If small coal were to be used in the charge, the pressure drop across the retort would become excessive and lead to uneven distribution of heating gases through different parts of the charge.

The coals used must be very weakly caking, since any tendency for the pieces of coal to fuse together would obstruct the passage of gases through the charge. The pieces of smokeless fuel discharged from the retort retain substantially the same size and shape as the pieces of coal originally charged, apart from the smalls which are produced as the result of thermal and mechanical disintegration during passage through the retort.

The *Rexco* system produces a large surplus of fuel gas of relatively low calorific value, about 140 Btu cu ft.

The yields per ton of coal carbonized are said to be of the order of 13 cwts of *Rexco*, 18 gallons of liquid products, and a gas surplus of about 25,000 cu ft.

The liquid products from the process are sold to tar distillers, to be refined along with coal-tar from high temperature carbonizing processes.

The N.C.B. Briquetting Processes

The National Coal Board Coal Research Establishment at Stoke Orchard has been engaged for some years in developing low temperature carbonizing systems for the production of reactive smokeless fuel. These processes are still in the experimental stage, although it has been indicated that a full scale plant is expected to be in operation by 1965.

The N.C.B. systems appear to be based on the following stages:—

1. Crushing and grinding the coal.
2. Oxidation and or partial devolatilization of the coal in a fluidized bed.
3. Briquetting, with or without some form of binder.
4. Further carbonization, where necessary, to remove the smoke-forming constituents of the binder introduced during briquetting.

With a fuel prepared in this way from finely crushed coal, there is a tendency for the fuel to become masked with ash on the fire-grate, giving the fire a very poor appearance. No doubt the N.C.B. are fully aware of this difficulty and we shall have to wait and see whether it can be satisfactorily overcome.

The Rochdale Process

The Rochdale Process, by which *Phimax* is produced, employs a normal gas-works continuous vertical retort. In addition to supplying heat to the coal in the normal way by thermal conduction through refractory brick walls, heated fuel gas is passed upwards through the coal charge to accelerate carbonization. The circulated fuel gas, or carrier-gas, gains its preheat from the hot coke which is continuously discharged from the base of the retort. By this means, it has been found possible to effect a substantial increase in the throughput of a retort of given size and, at the same time, to produce a coke which is more reactive than normal gas-coke.

Although the carbonizing temperature at which *Phimax* is produced is lower than in normal gas works practice, it is still to be regarded essentially as high temperature carbonization; the reactivity of the fuel, although greater than that of normal gas coke, is still appreciably lower than that of a low-temperature semi-coke.

Chemical Products from Low Temperature Carbonization of Coal

Thermal cracking accounts for the differences in the quantities and compositions of the oils and gases recovered from the two different systems of carbonizing at high and low temperatures.

Even in a coke-oven or gas-retort, where the walls may be heated to more than 1200°C, this very high temperature progresses only very slowly into the coal charge itself, at a rate of the order of half an inch per hour. Thus, each successive layer of coal has to pass through an initial stage of dehydration, followed by low temperature carbonization, before being subjected eventually to the high temperature coking stage.

Practically all the hydrocarbons have been released from the coal by the time that its temperature has reached 600°C, which means that the primary volatile products from both high- and low-temperature coal carbonizing systems must be the same. These primary distillation products escape substantially unchanged from the retorts of low-temperature carbonizing systems but, in high-temperature carbonization ovens and retorts, they pass outwards through the adjacent layers of hotter coke and eventually rise up the side of the oven walls which may be at 1200°C or more. It is this prolonged contact between the vapours and the high temperature surfaces of the coke and the oven walls which results in the cracking of some of the hydrocarbons. This thermal decomposition causes the deposition of carbon on the coke, the gas yield increases, the tar yield falls heavily and its composition changes very substantially.

Crude Coal-Oil

The following is an outline of the chemical materials which are being produced from low-temperature coal-oil, and of the refining processes employed.

The refinery at Bolsover handles all the liquid products from the carbonizing plants at Bolsover and Askern—about 12 million gallons of crude coal-oil and 2½ million gallons of crude gas-spirit per year.

The crude coal-oil, which is quite mobile at atmospheric temperature, is distilled to produce five fractions: light oil, middle oil, heavy oil, wax oil, and pitch. Although batch stills were used initially for distillation of the crude coal-oil, tube stills of the type used in the petroleum industry were adopted for this purpose in 1938 and have been used exclusively ever since.

The laboratory distillation range for the crude coal-oil is given in Table II.

TABLE II
DISTILLATION RANGE OF "COALITE" CRUDE COAL OIL

°C	Per cent distilled
180	4
210	13
213	21
250	30
270	39
290	44
310	50
330	55
360	67

Compared with these results from batch distillation in the laboratory, distilling to 360°C in a tube still has the effect of increasing the total distillate by about 10 per cent, with a corresponding reduction in pitch yield.

Table III gives an indication of the separation made by primary distillation.

TABLE III
PRODUCTS OF PRIMARY DISTILLATION

Fraction	Per cent distillate
Light oil	2
Middle oil	38
Heavy oil	10
Wax oil	20
Pitch	25
Water and losses	5

Light Oil

This is the overhead fraction, representing 25 per cent of the crude-oil fed to the still. It is composed of approximately 86 per cent hydrocarbons, 12 per cent phenols, and 2 per cent of bases.

The phenols are extracted with caustic soda and eventually refined along with the phenols recovered from the other distillates and the liquor. The bases are removed by sulphuric acid, whilst the hydrocarbons are added to the crude gas-spirit for the eventual production of gasoline and solvents.

Hydrocarbons from the light oil comprise a mixture of roughly equal parts of saturateds, olefins, and aromatics.

Middle Oil

This first side-stream accounts for almost 40 per cent of the ingoing feed and is the raw material source for many of the refined chemical products. It comprises approximately 52 per cent hydrocarbons—half aliphatic and half aromatic—45 per cent of phenols, and 3 per cent of bases.

Here again, the first stages in refining are to extract the phenols and bases by means of caustic soda and sulphuric acid washing respectively.

The hydrocarbon fraction is then subjected to further washing processes, distillation and filtration, to produce a diesel oil having a relatively low cetane number of 25 to 27, which is raised to cetane number 32 by the addition of *iso*propyl nitrate. The specific gravity of the diesel oil is 0·905 and distils between 175°C and 315°C. It is used in admixture with petroleum diesel oil for road traction.

Heavy Oil and Wax Oil

Together, these two heavier fractions amount to about 30 per cent of the crude oil input. They comprise hydrocarbons—including solids such as anthracene and paraffin wax—and phenols, in the approximate ratio of two to one. Even though the complex phenols from these heavier distillates have bactericidal efficiencies up to 50 times that of phenol itself, they have so far found only limited applications and the extent to which they are extracted from the heavy oil fraction is therefore similarly limited.

The heavy and wax oils are distilled and/or blended with other fractions to produce creosote, fuel-oils, fluxing, and flotation oils, etc.

Pitch

The vapour-line temperature of the continuous tube stills is 350°C; this gives a 25 per cent residue of pitch which is run off continuously from the base of the fractionating column. Being low in free-carbon content (less than 5 per cent), the pitch has found widespread use in the manufacture of coloured mastic floors and, after polymerization and hardening, for coloured floor tiles. Pitch is also produced for briquetting purposes.

Crude Gasoline

As mentioned previously, the crude gas-spirit is recovered from the low temperature coal-gas in much the same way as natural gasoline is recovered from the natural gas of the oil fields.

During the process of recovering the crude spirit from its absorbing oil, the opportunity is taken to condense it fractionally into "light" and "heavy" crude spirits, which subsequently facilitates the chemical washing processes.

The composite crude spirit comprises approximately 25 per cent paraffins and naphthenes, 50 per cent olefins, and 25 per cent aromatics. Refining of the crude spirit consists essentially of the removal of phenols and bases, followed by distillation, and various sweetening processes.

The final product—*Coalene* gasoline—has the properties shown in Table IV.

TABLE IV
"COALENE" GASOLINE

Specific gravity at 60°F		0·766
Octane rating (research method)		85
Ibp		<50°C
Fbp		165°C
		Per cent
Distilling at	50°C	1
,,	60°C	2·5
,,	70°C	7
,,	80°C	15
,,	90°C	26
,,	100°C	40
,,	110°C	52
,,	120°C	64
,,	130°C	76
,,	140°C	86
,,	150°C	92
,,	160°C	96

Aqueous Liquor

Each ton of coal charged to the retorts yields about 34 gallons of liquor, containing ammonia and its salts and a little more than 1 per cent of phenols. At one time, this liquor was regarded as a troublesome effluent. A few years ago, however, *Coalite* developed a process to recover the

phenols from the liquor and this system now makes a small contribution to the overall economy of the process in addition to making the effluent more readily disposable.

The phenols are extracted from the liquor by counter-current washing with butyl acetate. Solvent stripping and continuous fractionation lead to the separation of crude monohydric and dihydric phenols in the approximate ratio of two to one.

TABLE V
DIHYDRIC PHENOLS

	Formula	*Melting point*	*Boiling point*	*Uses and suggested uses*
Catechol (Pyrocatechol)	$C_6H_6O_2$	105 C	245 C	Anti-oxidant azo-dyes, tanning agents, resins, pharmaceutical products
3 Methyl catechol (*iso*-homo-catechol)	$C_7H_8O_2$	68 C	248 C	Photographic developers, dyestuffs
4 Methyl catechol (homo catechol)	..	66 C	258 C	Inhibitors, pharmaceutical products
Resorcinol	$C_6H_6O_2$	110-111 C	276 C	Dyestuffs, resins, adhesives, glues, antiseptic and pharmaceutical preparations
2 Methyl resorcinol	$C_7H_8O_2$	118 C	267 C	Fur dyeing dyestuffs, synthetic glues, drugs
4 Methyl resorcinol (Cresorcin)	..	103-104 C	279 C	Synthetic resins, glues, and dyestuffs
5 Methyl resorcinol (Orcin)		108 C	296 C	Synthetic resins and glues, dyestuffs
2:4 Dimethyl resorcinol	$C_8H_{10}O_2$	110 C	271 C	Dyestuffs, synthetic glues
2 Methyl quinol (Toluhydroquinone)	$C_7H_8O_2$	124-126 C	283 C	Photographic developer

The crude monohydric phenols are passed forward for refining along with the monohydric phenols recovered from the various distillate oils, whilst the crude dihydric phenols are further refined by fractional distillation, recrystallization and centrifuging to give the pure dihydric phenols shown in Table V.

Recovering and Refining the Monohydric Phenols

As mentioned previously, the crude phenols are removed from the primary oil distillates by washing with caustic soda. The resulting sodium phenate—or cresylate as it is often called—is treated with steam to remove traces of oil and then reacted with carbon dioxide, under pressure. The carbonic acid releases the phenols, or crude cresylic acid, and the caustic soda is converted into sodium carbonate which is later reacted with lime to reproduce caustic soda, which can then be used for the extraction of further phenols from the oil distillates.

The crude phenols are first dehydrated in batch stills and are then mixed with the monohydric phenols extracted from the aqueous liquor; from then on, the distillation process is continuous, as illustrated in Fig 5.

Fractionating of tar acids

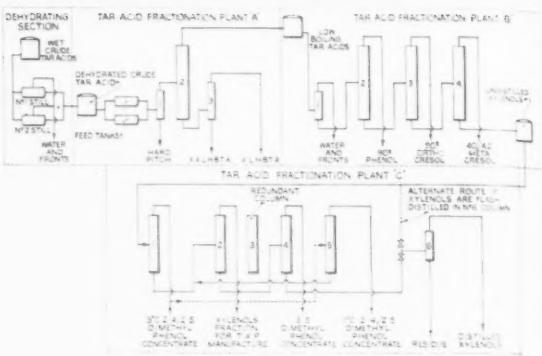


Fig 5

The tar acid fractionation plant is in three sections: A, B, and C.

The first column of plant A depitches the crude acids, a high melting point pitch (110 C: R & B) running continuously from the base of the column. The second column effects a split at 230 C; the phenols distilling at temperatures above 230 C leave the base of this second column to enter a third column where they are further separated into two grades of high boiling phenols. The phenols distilling below 230 C pass overhead from the second column, through intermediate storage, into plant B.

Here, water and "fronts" are removed in the small dehydrating column, which precedes three fractionating columns from which the overhead fractions are consecutively 90 per cent phenol, 90 per cent ortho cresol and a meta para cresol fraction. The residue from the base of this last column consists of crude xylenols—which pass to plant C for fractionation.

The tar acid fractionation plant

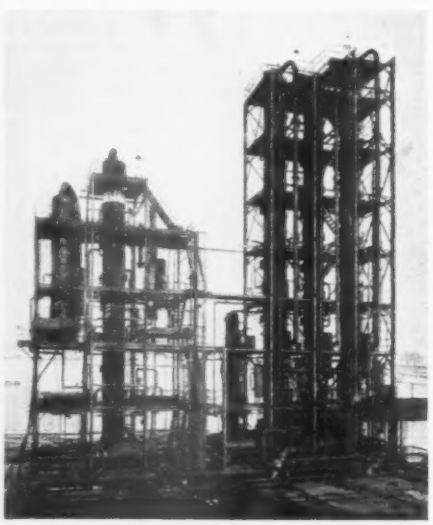


Fig 6

If need be, the xylenols—or dimethyl phenols—can be fed direct to the sixth and last column of plant C to give a distillate of mixed xylenols but, in general, columns 1, 2, 4, and 5 are used in turn to produce successively the fractions:

1. 3 C 2:4 2:5 xylenol concentrate.
2. An xylenol fraction to be used as the raw material for another plant producing tri-xylenyl phosphate (TXP), a plasticizer for PVC.
4. 3:5 xylenol fraction.
5. 1 C 2:4 2:5 xylenol encentrate.

In addition, an adjacent redistillation plant is used to produce pure phenol and pure ortho cresol from the 90 per cent fractions produced on plant B.

The various phenols and higher boiling cresylic acids find many applications, including the manufacture of phenol—formaldehyde resins, plasticizers, ore-flotation agents, disinfectants, wetting agents, pharmaceutical products, inhibitors, antiseptics, etc.

Fig 6 shows part of the tar acid

TABLE VI
MONOHYDRIC PHENOLS

	Formula	*Melting point*	*Boiling point*	*Uses*
Phenol	C_6H_6O	43 C	183 C	Dyestuffs, explosives, pharmaceutical products, perfumes, synthetic resins, etc.
Ortho-cresol	C_7H_8O	30·3 C	191 C	Dyestuffs, explosives, weed killers, perfumes, pharmaceutical products, plant washes, etc.
2:6 Dimethyl phenol (Xylenol)	$C_8H_{10}O$	45 C	201 C	Synthetic resins, dyestuffs, inhibitors
2:3 ,,	,,	73 C	216 C	,,
3:4 ,,	,,	62·5 C	227 C	,,
2:5 ,,	,,	75 C	211·5 C	These dimethyl phenols are usually produced together in a short cut fraction
2:4 ,,	,,	26 C	211·5 C	Uses as for above dimethyl phenols
3:5 ,,	,,	64 C	221·5 C	Manufacture of P.C.M.X. and synthetic resins
2:3:5 Trimethyl phenol	$C_9H_{12}O$	95 C	233 C	For the synthesis of Vitamin E
3 Methyl-5 ethyl-phenol	,,	54 C	233·5 C	Manufacture of styrene type resins and special phenol - formaldehyde resins
4 Hydroxy-hydrindene	$C_9H_{10}O$	50 C	245 C	
5 ,,	,,	55 C	250 C	
Beta naphthol	$C_{10}H_8O$	122 C	290 C	Intermediate in the dyestuffs industry

fractionation plant, whilst Table VI gives details of some of the monohydric phenols produced.

Miscellaneous Products

Summarizing, the main bulk products on the chemical side comprise motor spirit, diesel oil and fuel oils, creosote, pitch, and a very comprehensive range of monohydric and dihydric phenols.

In addition to supplying phenols as the raw material for other industries, some are further processed at the Bolsover refinery.

Chlorinated phenols, basic materials for antiseptics and selective weed-killers, are produced by reacting various phenols with gaseous chlorine or sulphuryl chloride, *e.g.*:

2:4-dichloro-phenol
Parachloro-ortho-cresol
Orthochlorophenol
Parachlorophenol
Dichloro-meta-xylenol (DCMX) (from 3:5 dimethylphenol fraction)
2:4:6-trichlorophenol
Chlorinated xylenols, etc.

Some of the phenols are fed as raw material to the phosphate plasticizer plant, where they are reacted with phosphorus oxychloride to produce tri-xylenyl phosphate, tritolyl phosphate and, more recently, a non-toxic plasticizer for foodstuff wrappings. Fig 7 shows part of the phosphate ester plant.

Hydrochloric acid is a by-product of the reactions involving chlorine and phosphorus oxychloride. The acid gas is absorbed in water and marketed as 35 per cent hydrochloric acid.

Part of the phosphate ester plant

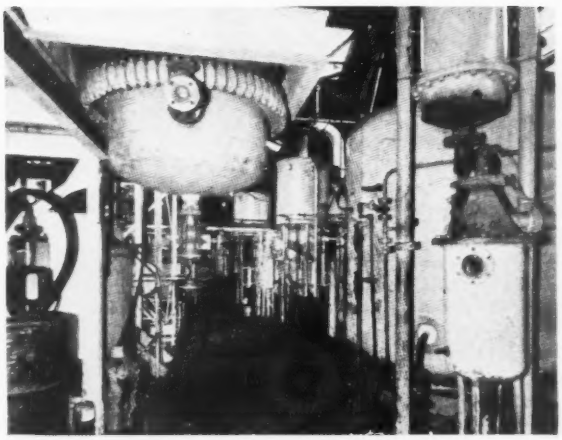


Fig 7

Technical grade catechol is reacted with tertiary butyl alcohol to produce tertiary butyl catechol—an anti-polymerizing agent.

These examples are, perhaps, sufficient to illustrate the progress which has been, and is still being made in developing chemical products from the crude condensates resulting from the low temperature distillation of coal.

Conclusion

To conclude, it might be of interest to examine briefly the beliefs which have stimulated the low temperature carbonizing industry since the very early days of its development; they still appear appropriate to the circumstances of 1961.

1. That the open fire will continue as a popular method of domestic heating in the United Kingdom.
2. That clean air will arouse increasing public support.
3. That the cokes made by conventional high temperature carbonizing processes are not sufficiently reactive to be acceptable to the average housewife as a smokeless substitute for coal.
4. That low-temperature semi-cokes, being as reactive as coal, in addition to being smokeless, will be more readily accepted for the open fire.
5. That it will become realized that even though these semi-coke "patent fuels" cost more per ton, their efficiency is one-third higher than that of coal—which cancels the difference in price. Advantages over coal in respect of consistency of quality, smoke and soot abatement, general cleanliness, and convenience tip the scales heavily in their favour.
6. That recovery of the smoke-producing materials from coal before burning it is a logical step to take. Valuable by-products are recovered and yet the smokeless coal produced is more effective for open-fire domestic heating than the original coal from which it is made. Certainly the processing has to be paid for, but everyone gains in the end.

Around the Branches

ABADAN, BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD, YORKSHIRE

Northern Branch

Annual Dinner and Dance

Organizers of the Yorkshire Branch's first annual dinner and dance, held at the Old Swan Hotel, Harrogate on 24 March have good reason to be proud of that event which was voted a complete success by all present. Total attendance was not far short of 150 and included members of the Branches Committee of the Institute and their ladies.

Guests were received by G. J. C. Vineall, chairman of the Branch, and Mrs Vineall, and by Sir Stephen Gibson, C.B.E., chairman of the Branches Committee, and Lady Gibson

Highlight of an excellent meal was the arrival of the sweet course—Swanlake Meringue. There were many expressions of surprise and pleasure as the waitresses entered the room each bearing a dish holding a large swan-shape meringue filled with ice-cream and several smaller and similar meringues holding fruit salad. After dinner, two short speeches completed the formal proceedings and dancing then started and continued until 1 a.m. Albert Furness, Branch honorary secretary, and the members of the Social Committee are to be congratulated on the results of their endeavours.

Proposing the health of the guests and visitors, G. J. C. Vineall said that this was the first occasion on which the Branches Committee meeting had been held in Yorkshire. It was the practice to offer hospitality to the Committee when it visited a branch and it was appropriate that the entertainment should be representative of Yorkshire—the food, the countryside, and the people. To the members of the Branch it was an added enjoyment to have members of the Branches Committee with them.

He also welcomed all their visitors, and in particular George Hey of the Yorkshire Lubricating Oil and Grease Federation, to whom they owed much in connexion with the formation of their own organization, and George Sell, the editor of the Institute's publications. The latter was retiring in a few days after fifty years in the oil industry and an association with the Institute going back to its foundation in 1913. The toast was coupled with the name of Sir Stephen Gibson, chairman of the Branches Committee, whom he was specially pleased to welcome.

Sir Stephen Gibson, C.B.E., responding on behalf of the guests, said it was not just chance which had led to the formation of the Yorkshire Branch. The formation of the IP branches in the United Kingdom followed a suggestion made by the late Lord Cadman in the mid-1930's that the then Institution of Petroleum Technologists should be built on a broader base than just technology. It should be the Institute of Petroleum and its membership should be open to anyone concerned or associated with the industry. Its operations could not therefore be confined to the main body in London or to a few specialist branches in oil areas overseas. Thus, the branches in the United Kingdom had come into existence.

It had been of considerable interest, said Sir Stephen, to watch the change from small gatherings of a few people to discuss specialist problems to the meetings of wider scope held by the branches. The strength of the Institute was moving from the London headquarters to the branches and it was there that the future lay.

The industry was expanding at the rate of 6 or 7 per cent annually and it might be anticipated that the activities of the Institute would approximately double in each decade. Branches were, therefore, more than necessary.

Concluding and thanking the Yorkshire Branch for their hospitality, Sir Stephen said it was a happy thought to combine the visit of the Branches Committee with the dinner-dance as it provided a welcome opportunity for the members of the Committee to meet members of the Branch.

South-Eastern Branch delegates seem to have something on their minds

The Yorkshire Branch Annual Dinner and Dance

Sir Stephen Gibson responds to . . .

G. J. C. Vineall who proposed the health of the guests and visitors

Chemicals in the Service of Agriculture

T. Millinger of I.C.I. Ltd, delivered a paper on "Chemicals in the Service of Agriculture" to a Branch meeting held under the chairmanship of W. R. Sidery at the Engineers' Club, Manchester, on 21 March.

He outlined the historical aspect of pesticides in general, and said their systematic use appeared early in the 19th century. Developments up to the outbreak of the second world war were said to include the organo-mercurials, and tar oils, as well as organo-sulphides, which were introduced after a consideration of their chemical reaction in the vulcanization of rubber.

The impetus given to food production by the war stimulated a search for crop protection chemicals, made more necessary by intensive monoculture which had increased the incidence of pests. Mr Millinger went on to say that in the field of insecticides DDT and BHC were the best known, and that these were followed by many other chlorinated hydrocarbon insecticides and organo-phosphorus compounds. Some of the latter had proved highly toxic to man and further developments had resulted in much safer compounds based on phosphorus. Fungicides derived from dithiocarbanic acid had become prominent as had selective weed killers based on aryl-oxyacetic acids, and an American discovery, the substituted ureas, would possibly displace the conventional chlorates as total weed killers. Of interest to gardeners was the couch grass killer, dichloro-propionic acid. The enhanced palatability of crops treated with arsenicals had led to numerous deaths of cattle, and these had now been withdrawn in the U.K. and were likely to be replaced by the di-pyridyls for potato haulm destruction.

The rate of growth of the industry was illustrated by the fact that the number of chemicals commercialized had increased threefold in the ten years preceding 1958. This rate was not likely to be maintained, however, because of the high cost of putting a new pesticide on the market—an American estimate put the cost at over £1 million. In America the total tonnage of pesticide had remained almost static since 1945 but individual types had changed appreciably as the newer and more active compounds had displaced arsenicals and copper compounds.

The next section of the lecture was devoted to the application of petroleum oils in this field, the particular requirements being related to distillation range, viscosity, and unsulphonatable residue. The latter characteristic, it was said, has a bearing on the phytotoxicity of the oil, the unsaturated hydrocarbons being oxidized to oil soluble acids which attack foliage. The reasons for having oil of the correct volatility and viscosity were illustrated, together with the need for fortification with more potent insecticides. The lecturer then considered in more detail the various ranges of oils and emulsions and their particular applications, advantages, and disadvantages.

In several instances, oils had been displaced by chemical compounds only to return when the pests developed a resistance to the chemicals. Moreover, the use of some newer insecticides often interfered with the pest predator relationship. Control of malaria by spraying oil on breeding grounds of the mosquito and the more effective alternative of treating all interior surfaces of buildings in rural areas was discussed, and the two systems were said to be complementary in many areas. If sufficient finances and technical resources were available, it was believed that malaria could be eliminated from most malarious territories within a comparatively short period.

The use of technical white oils for pest control in food warehouses was mentioned, before the speaker passed on to house pests, including furniture beetle which had increased considerably since the war. The necessity for choosing an oil appropriate to the application was stressed. Oils used as herbicides were said to have a low viscosity and surface tension, and sometimes to include aromatic fractions and chlorinated benzenes. As fungicides, oils did not appear to have many applications, the principal one being the control of banana leaf spot.

Mr Millinger ended by discussing the compounds produced as by-products of petroleum refining and cracking processes, including aldrin and dieldrin, and a range of surfactants. The latter, he said, found their way into almost all formulations of wettable and dispersible powders and miscible oils. An interesting chart was drawn to show the production of an insecticide formulation from crude oil.

Production of Olefins and Aromatics

The last event of the 1960–61 session was a joint meeting with the Institution of Chemical Engineers on 18 April, when a paper by D. R. Cummings, N. Ruhemann, and W. L. Seddon, entitled "Recent Developments in the Production of Olefins and Aromatics by Petroleum Cracking", was read by W. L. Seddon.

In the paper, the authors said that they considered that the pattern of the last five years indicated that the demand for certain olefins and aromatics was still increasing. A large potential market for capital equipment was said to exist, and a review of methods of manufacture and economics of operation would be of value to suppliers.

The paper went on to state that the production of ethylene from straight run naphtha was favoured in Europe, but the lack of this feedstock in some locations had resulted in crude oil and heavier fractions being considered. Cracking was effected in tube furnaces or by contact with solid particles, and propylene was also produced, the percentage depending on the feedstock and the cracking conditions. Although the major proportion of benzene came from coal, high purity material was also produced by dehydrogenation of naphtha in the presence of platinum, toluene and xylene being formed at the same time. Purification by solvent extraction and subsequent distillation was necessary to

obtain nitration grade aromatics. It was considered that simultaneous production of aromatics and olefins by cracking was possible, the yields of the products depending on feedstock and cracking conditions. The full potentialities of this process were only now being realized. A plant using these principles was erected by Petrochemicals Ltd, and gave a low yield of ethylene which made the process uncompetitive. Improvements by way of lower operating pressure, shorter residence time, and higher tube temperatures had given a higher ethylene yield while still maintaining highly aromatic liquid products. This deep cracking process was said to increase the ethylene and benzene yields at the expense of propylene and C_4 olefins. Consideration of heat transfer rates, materials of construction, and pressure drop through the coil led to the conclusion that there was a maximum tube length and diameter beyond which it was not practicable to go. This in turn limited the output of the furnace to about 15,000 tons year of ethylene and any large installation would, therefore, contain a multiplicity of furnaces.

Separation of gaseous components was now generally achieved by a distillation process, rather than the earlier absorption processes. A wide divergency of opinion existed on the best methods of operation, the main factors involved being operating pressure, location of acetylene removal, demethanizer conditions, and final purification facilities. Both high and low pressure plants were being constructed, and the preference was said to be for the former. Low pressure processes, however, were believed to offer more scope for development.

The deep cracking process yielded a liquid fraction from which the recovery of aromatics was a relatively simple matter, consisting of distillation, followed by sulphuric acid treatments to remove olefin and azeotroping with methanol to remove paraffinic constituents.

The capital cost of a unit to produce 40,000 tons year of ethylene was estimated to be £3½ million and the cost of ethylene on this scale of production to be less than £40 ton.

Stanlow Branch

AGM

The Branch AGM was held in the Lecture Theatre, Grosvenor Museum, Chester on 18 January. Messrs Thompson, Cluer, and Biske were re-elected to the committee, together with Messrs Tinker and Winterbottom, who had previously been co-opted to replace Messrs Swain and Taylor who had left the area. The committee members listed in the Branch report in the March *IP Review* were those for 1960.

The Carrington Pipeline

In the absence of C. N. Thompson, V. Biske took the chair at the Branch meeting on 15 March and introduced L. C. Knight, B. S. Lidington, and G. C. Rose, who delivered their talks on "Conception, Construction, and Use of the Carrington Pipeline".

The opening speaker developed the reasons for laying the pipeline, and discussed the choice of route. He also described the products carried by the line on behalf of both Shell-Mex and B.P. Ltd and Shell Chemical Co. Ltd from Stanlow to the terminals at Partington and Carrington.

The second paper dealt with the constructional aspects of the project and covered such details as setting out, pipe stringing, welding, trenching, radiographing, bitumen coating, and insulating.

The last speaker described the testing and commissioning of the pipeline and the operating experience so far obtained. He also discussed methods of operation with particular reference to the use of batching pigs and spheres and the organization and supervision of the operation of the lines.

London Branch

AGM

The Annual General Meeting of the London Branch was held at the Institute on 21 March, when the following members were elected to the Committee: J. H. M. Clark, R. F. Leach, C. A. Stradling, D. M. Watson, and G. Yeomans.

Fifty Years in the Oil Industry

Following the AGM, George Sell spoke to the Branch about his "Fifty Years in the Oil Industry". Looking at George, it was difficult to believe that he could have been in the industry for 50 years, but he assured his audience that it was as long ago as that since he started as an office boy in Arthur Eastlake's office at 7*s* 6*d* per week for a five day week of "unlimited duration". In those days, he said, it was very different from the present time when the boss is expected to get cigarettes for the office boy.

The talk was illustrated by fascinating slides covering a wide field of operations from discovery to refining, and showed hand dug wells of the early days, modern and ancient drilling in water, old and new ocean tankers, and the latest method in transportation—the *Dracone*.

As one would expect, the talk was interspersed with amusing anecdotes. On one occasion, when he was a Petrol Rationing Officer during the last war, he said he was asked to send coupons to one firm who wished to send them out as Christmas presents.

After the paper, N. E. F. Hitchcock expressed members' appreciation of all that George had done for the Branch since it started as the Students Branch before the war. He said that George had always shown particular friendship for the younger members, was always there to help when needed, and had "inherited friendship throughout his life".

Following this, the chairman, S. C. Price, made a presentation of a record player to mark George's retirement from his post as editor of the Institute and as an indication of appreciation from the Branch for all that he had done for it. He also said that Mrs Sell had always been there to support her husband at Branch functions and it seemed appropriate that she should

choose the first record. He then presented her with a record token.

After the meeting closed twenty members of the Branch entertained Mr and Mrs Sell to dinner at the Clifton Ford Hotel.

Scottish Branch

The Branch held a joint meeting with the Stirling and District Sections of the Royal Institute of Chemistry and the Society of Chemical Industry in the Recreation Hall of BP Refinery, Grangemouth, on 23 March. D. Blair Watt, vice-chairman of the Branch, presided and introduced K. G. Burridge who spoke about "The Production and Applications of Synthetic Rubber".

Mr Burridge started by quoting statistics showing the current consumption of synthetic and natural rubber. Mention was also made of production and consumption of synthetic rubbers in the U.K. in relation to the rest of the world.

The remainder of the talk was devoted to styrene butadiene rubbers. Mr Burridge outlined the design process for their manufacture with particular reference to some features of the chemistry of the polymerization stage. He then gave a short history of SBR manufacture in the United Kingdom, coupled with some comments on the design and construction of the plant at Southampton, which was shown on slides used to illustrate the commercial manufacturing process.

The talk concluded with a survey of the types of SBR and SBR Latices made in the United Kingdom. Mr Burridge said that these comprised three oil extended grades, four "cold" grades, and one "hot" grade. One type of high solids latex is also available.

The use of the grades was discussed and a major application was said to be in vehicle tyres, especially passenger car tyres, and there is an increasing use of SBR in footwear, cables, flooring, belting, and various kinds of mechanical goods. SBR latex is being used in the manufacture of foam rubber upholstery, and its introduction into the field of carpet backing compounds, carpet underlay, adhesives, rubberized hair, etc., is being developed.

LIBRARY SHORTAGES

The Institute Library is short of certain periodicals which are required to complete sets for binding. The missing parts are listed below, and the Librarian will be grateful to hear from any member having spare copies for disposal.

Chemical Engineering. Vol 67, No 7. 4 April 1960.
Geophysical Abstracts. 166. July–September 1956.
167. October–December 1956.
Index for 1956.
168. January–March 1957.
169. April–June 1957.
Index for 1959.
L'Industrie du Pétrole. October 1958.
Kemija u Industriji. Indexes for 1959 and 1960.
National Petroleum News. February 1959 and November 1960.
Pipe Line News. July 1960.
World Oil. January–June 1958, plus index for 1958.

COST OF FUEL OIL DUTY

The Chancellor of the Exchequer has estimated that the imposition of a 2*d* a gallon duty on heavy oils other than those used as road vehicle fuel will raise an extra £50 million in a full year for the Exchequer. The table reproduced below, which was prepared by the Petroleum Information Bureau, shows the probable additional expenditure which industrial users of oil products are likely to incur as a result of this duty. The figures are based on consumption by the industries cited during 1960, and do not take into account any increase in consumption which may occur in 1961.

Gas, diesel, and fuel oils	*Gas diesel*	*Fuel oil*	*Total*
Burning:	£	£	£
Central heating:			
Private houses	513,839	23,051	536,890
Other premises	1,246,963	4,609,410	5,856,373
Bakeries	55,374	230,025	285,399
Glass	59,888	794,230	854,118
Ceramics	31,241	430,720	461,961
Steel manufacture:			
Open hearth	3,228	3,023,829	3,027,057
Other	150,639	1,541,872	1,692,511
Industrial furnaces:			
Metallurgical	145,346	681,005	826,351
Other	214,045	703,157	917,202
Agricultural driers and heaters	114,563	67,682	182,245
Steam raising:			
Public elec. generation	21,155	10,449,487	10,470,642
Other	178,772	8,017,928	8,196,700
Power:			
Agricultural power units	1,241,250	12	1,241,262
Rail traction:			
Railways	531,310	6,040	537,350
Industrial	82,619	1,285	83,904
Stationary oil engines:			
Public electricity supply	85,591	61,562	147,153
Other	884,695	31,104	915,799
Mobile diesel engines	882,869	47,167	930,036
Manufacture:			
Gas making	524,319	317,903	842,222
Other manufacturing	106,233	1,079,753	1,185,986
Petroleum industry's own use	55,919	341,889	397,808
	7,129,858	32,459,111	39,588,969

Burning oil:	£
Farming	35,500
Industrial and railways	118,333
Services and other Government	63,900
Domestic heating, lighting, and cooking	2,847,100
	3,064,833

Vaporizing oil:	£
Agricultural tractors and stationary engines	623,330
Industrial	32,083
	655,413

Lubricating oils and greases:	£
Aviation	20,750
Industrial	1,079,000
Marine	151,475
Motor	674,375
Tractor	76,775
	2,002,375
TOTAL	45,311,590

A YEAR OF ACHIEVEMENT FOR IRANIAN OIL OPERATING COMPANIES

Crude oil production in the Agreement Area in South Iran rose by 14 per cent in 1960 to a record level of 51 million long tons, according to the *1960 Annual Review* of the Iranian oil operating companies, Iranian Oil Exploration and Producing Company and Iranian Oil Refining Company. Of this total 32·9 million tons were exported, some 16 per cent more than in 1959; 14·6 million tons were sent to the refinery at Abadan for export as products, an increase of 9 per cent over the previous year; and 3·1 million tons were used within Iran, a figure which was 11 per cent higher than in 1959.

The attainment of these record export figures was facilitated by the completion of the Gachsaran/Kharg pipeline, and the Kharg loading terminal, since pipeline and loading facilities at Bandur Mashur were already working almost to full capacity. At the end of 1960, 190,000 bd of crude were being exported from the Kharg Island terminal.

Crude throughput at Abadan refinery showed a 9·5 per cent increase to average 351,000 bd. During the year, a large naphtha thermal reforming unit was recommissioned, to bring plant capacity for improving the octane rating of motor gasoline up to 70,000 bd. Other projects either proposed or under construction at the refinery included a 20,000 bd naphtha catalytic reforming unit, which will cost £3·6 million and come into operation in 1962.

Three heavy drilling rigs, three seismic parties, a gravity party, two geological parties, and two topographic parties were deployed over widely separated parts of the Agreement Area in the search for new deposits. A commercial field was discovered at Ahwaz, some hundred miles north of Abadan, where well No 6 produced on test at an average rate for the year of 6032 bd, and oil was discovered at Binak, near Gavanah, although it was not known whether this would prove a commercial field.

Apart from the three rigs carrying out exploratory work, five others and one light repair rig were engaged in development and maintenance of existing fields. A total of 106,494 net feet of hole was drilled, of which 40,490 ft were exploratory, 63,437 ft were development drilling, and 2567 ft resulted from workovers. The average drilling rate jumped from 37·7 ft string day in 1959 to 46·7 ft in 1960.

The main development effort was concentrated in Gachsaran, where six wells were drilled. Two of them had a total potential of 60,000 bd, two were each in the 5000 bd class, and the other two were completed as observation wells. Two wells were completed in Agha Jari for a joint potential gain of 55,000 bd, and a reservoir observation well was also drilled.

The overall development drilling programme achieved a gain of 125,000 bd in new potential production, while a further 33,000 bd resulted from workovers. Normal decline in overall potential in some of the older fields, however, slightly offset the overall increase in potential.

Agha Jari remained the major producing field during the year with an average output of 669,000 bd, compared with 599,000 bd in 1959. The central area fields, Masjid-i-Sulaiman, Haft Kel, Naft Safid, and Lali, continued at a declining rate to average 263,000 bd. Gachsaran continued to produce at a rate of 60,000 bd for Abadan refinery and from July started producing for export from Kharg Island, which brought the average production for the year to 110,000 bd with a monthly peak of 209,000 bd in December.

Two of the major highlights of the year occurred in August, when the Iranian oil production passed 4 billion barrels, and in October, when a new monthly record of 1,202,000 bd net was achieved.

The two operating companies provided a revenue to Iran of £101,794,000 in 1960, an 8½ per cent increase over 1959. Their expenditure within the country exceeded £30,000,000, of which more than £24 million came from abroad.

Petroleum in Parliament

Emission of Diesel Fumes

Asked whether, in view of the availability of the new Hartridge-BP smokemeter, the Minister of Transport would draft new regulations dealing with the emission of diesel fumes, the Joint Parliamentary Secretary to the Ministry of Transport said in a written answer on 19 April that the Ministry had been advised that none of the meters at present available was wholly suitable for roadside enforcement of limits on diesel smoke emission.

Industry's Tax Liability Remains Secret

On the same day, the Economic Secretary to the Treasury declined to reveal the oil industry's tax liability when a questioner asked how much in excess of £200 million the oil industry contributed to public revenue.

Imports of Russian Oil

In a debate on East-West Trade on 24 April, several speakers said that imports of Russian oil should be allowed into the U.K. One member said that loss of oil earnings had been responsible for a drop from £229 million to £22 million in two years in "invisible" earnings shown in the Economic Survey. He suggested that the argument that we could not allow imports of oil from Russia because of these earnings was no longer valid.

The Minister of State to the Board of Trade said that as a country in which two of the major oil companies are located, we are in fact oil producers, and the Middle Eastern countries from which most of our supplies come were important markets for our exports. It was not therefore a question of "invisible" earnings which had to be considered. If we cut our purchases from these countries they would have less money available to spend in the U.K.

I.C.I.'s Proposed Oil Distillation Plant

The Minister of Power was asked on the same day if consultations had taken place with the National Coal Board and I.C.I. before the latter's decision to build an oil distillation plant for the production of hydrogen, which was likely to cost the NCB a market for 600,000 tons year of coal. Replying on the Minister's behalf, the Parliamentary Secretary to the Ministry of Power warned against confusing the use of coal as a source of power with its use as a raw material, and said the Minister would not wish to dictate to a company about its choice of raw materials.

Liquid Methane Imports

The Parliamentary Secretary to the Ministry of Power told another questioner on 24 April that the Minister of Power was awaiting a report from the Gas Council before making a statement about future imports of liquid methane.

BP Terminal Opened at Angle Bay

The Rt Hon. Richard Wood, Minister of Power, watched by The Hon. M. R. Bridgeman, chairman of BP, unveiling a commemoration plaque

The project for a large tanker terminal at Angle Bay, in Milford Haven was first mooted by The British Petroleum Company in 1948, when the largest tanker afloat was a mere 30,000 dw tons and Britain's total refinery capacity only one seventh of the present level of almost 50 million tons a year. It was realized that the larger tankers which in the future would be supplying crude to the Llandarcy refinery would not be able to be accommodated at Swansea and upon Milford Haven fell the choice of a site offering a sheltered deep water harbour within reasonable distance from Llandarcy. On 20 April this year these far-sighted plans came to final fruition when the completed tanker terminal at Angle Bay was opened by the Minister of Power, the Rt Hon Richard Wood, M.P.

Costing a total of some £6½ million, the terminal comprises a jetty with two deep-water tanker berths in the lee of Popton Point; administrative offices at Popton Fort on the heights above; and a crude oil storage tank farm at Kilpaison, 1½ miles away, where the crude oil pipeline to Llandarcy commences.

The Jetty

The shore arm of the jetty, which extends 1350 ft into the Haven, carries a 16-ft roadway and a 32-ft wide open pipetrack. Of open construction, it is supported by hexagonal steel piles capped with precast concrete muffs. The pipetrack comprises two 26-in diameter lines through which the crude oil is pumped from the tankers; three 16-in bunker fuel pipes; and one 12-in diesel oil line. In addition, 12-in and 10-in lines are provided for fire-fighting and potable water respectively.

Two berthing heads are each capable of berthing 100,000-dw ton tankers in 54 ft of water. High water mark is about 85 ft.

The design presented difficulties since not many feet of softish silt overlie the rock. Messrs Rendel, Palmer, & Tritton, the consulting engineers, recommended that the best design to resist the considerable berthing force of a fully-laden 100,000-ton tanker would be for each berth to consist of a pair of solid mass-concrete strong points, known as a gravity structure, each 74 ft by 38 ft. The sea arm from which the berthing heads are extended is 1220 ft long and lies at right-angles to the shore arm. The total length, including the dolphins at either side, is 2300 ft.

Gravity fenders are mounted in sets of four on each jetty strong point; a set of four will absorb the energy of a 65,000-ton tanker moving at a speed of 1 ft/sec or a 100,000-ton tanker at 4/5ths ft/sec.

The electrically-operated Woodfield flow boom installation, or hose handling gantry, for each berth consists of four crude oil booms and two for bunker oils. The section of the deck under the hoses is drained independently to a "slops tank" to prevent oil pollution. Rain, water falling on the area, which may be contaminated by oil spillage, is also collected in this way, and the mixture of oil and water is pumped back into the crude oil line for eventual separation at the refinery.

Popton Fort

Built in 1863, the hexagonal bastion of the Fort was intended as a defence against possible French invaders and provides a setting for the administration and service area which does not jar with the beauty of the Pembrokeshire hills. The administration buildings and control centre are located in the upper works which have been rehabilitated to provide offices for the administration, marine staffs, crews, HM Customs, radio communication, marine stores, terminal stores, fire station, etc.

Four tanks, with a total storage capacity of 36,000 tons (two of 11,000 and two of 7000 tons), have been built in the lower part of the fort for the storage of heavy marine furnace oil, light fuel oil, and diesel oil. Lying in an oil-tight rock excavation in the fort area, the base level of the tanks has been taken down to keep them below the sky-line, and drainage passes through separators before entering the Haven. The bunkering installation is capable of delivering up to 750 tons of fuel per hour to the berthing heads. Provision for heating bunker tanks is included by steam from an automatic boiler installation. A potable water tank of 250,000 gal capacity is provided for gravity distribution to berthing heads for ships' water.

Tank Farm

One and a half miles away from the jetty at the south-east corner of Angle Bay itself lies the crude oil tank farm at Kilpaison. Its total area is approximately 220 acres, of which some 65 acres accommodate eight 21,000-ton capacity welded steel, floating-roof tanks. These are grouped in four pairs, each pair in an oil retaining bund. Crude oil is pumped by the tanker direct to the tank farm.

The linkup pipework is designed so that any selected pair of tanks may be emptied or filled, and the contents of any pair of tanks can be transferred to either or both of any other pair of tanks. A manifold is located at the pumphouse comprising four 26-in lines from each pair of tanks; this manifold will be connected to the two 26-in diameter main transfer lines from the jetty.

Popton Fort, which houses the administration offices at the Angle Bay ocean terminal

The single main pumping installation, located in what was the Fort's coastal battery galleries, comprises four electrically-operated centrifugal pumps arranged for series pumping. These have a capacity of over 700 tons/hour at the pipeline working pressure of 850 psi, the drive being directed by 650 hp motors operating on 3·3 kV. A minimum of two pumps is on load at any one time and the remaining pumps may be brought in according to the throughput required. With the present planned output it should not be necessary to use more than three of these pumps to pump the oil to the Llandarcy refinery. No booster pumping stations are needed along the route but there is a control valve at Llandarcy to maintain pressure at the highest point on the pipeline. There is also an automatic control valve at the pumping station to prevent surges when stopping the pumps.

The fire-fighting arrangements comprise a charged hydrant system supplied from a fire pumphouse taking its suction from an old mill pond which has been in existence since about 1600 AD.

Utilities

The estimated peak electricity demand is about 3750 kVA, the supply being taken from the South Wales Electricity Board by two 7½ mVA, 33,000 V overhead feeders terminating at the sub-station at Kilpaison Farm. Up to 250,000 gals/day of water are provided by gravity flow by the Council to a point on the south boundary of Kilpaison Farm. From this point the Company's own mains carries the supply to Popton Fort.

An aerial view of the terminal showing two 35,000-dw ton tankers, "British Energy" and "British Architect", discharging cargoes of crude

The Llandarcy Pipeline

The 18-in diameter pipe was supplied by South Durham Iron and Steel Company. The pipeline itself, laid by George Wimpey and Company, has a total length of 62 miles with a capacity of 5 million tons/year and consists of 13,000 electrically-welded lengths of pipe.

Passing through open country in Pembrokeshire, Carmarthenshire, Glamorgan, and Swansea County Borough, the pipeline is laid throughout its length at a depth of not less than 2 ft 6 in to the top of the pipe, and reaches its highest point 42 miles from Angle Bay at 672 ft. In the span of twenty hours the crude oil from Kilpaison arrives at Llandarcy refinery for processing.

Contractors for the terminal were as follows:—

Consulting engineers:	Rendel, Palmer & Tritton
Civil engineering contractor (marine work):	Christiani & Nielsen Ltd
Mechanical and electrical work:	Constructors John Brown Ltd
Sub-contractor for gravity fenders:	Weldall & Assembly Ltd
Shore construction:	Shellabear Price
Tank construction:	Motherwell Bridge & Engineering Company
Rehabilitation of Popton Fort:	George Argent. Hadsphaltic
Main pipeline construction:	George Wimpey & Company
Welding equipment:	Lincoln Electric Company Ltd

* * *

U.S. DRILLING COSTS RISE AS WELLS GO DEEPER

An estimated 49,563 oil and gas wells were drilled in the U.S. during 1959. Of these, 19,101 were non-productive dry holes.

Domestic oil producers expended $2,651,096,000 merely for drilling and equipping these wells, losing $820,775,000 of this in dry holes. Though the proportion of dry holes remained consistent with past years at about 38 per cent, and overall drilling activity was slightly down from preceding years, average drilling costs rose—because the industry was forced to drill deeper and deeper in the search for new supplies.

These figures and trends are reported in the third Joint Association Survey of Industry Drilling Costs, conducted by the American Petroleum Institute, the Independent Petroleum Association of America, and the Mid-Continent Oil & Gas Association.

The survey is based on 1959 data—the latest available—and is comparable to an earlier study conducted on the basis of 1955-56 data. For the first time, however, the report gives a breakdown of data for oil and gas wells.

Total wells drilled dropped 13 per cent from 1956, but total expenditures were down only 7½ per cent from the 1956 record levels. The rising average cost per well, notes the survey, "reflects primarily the fact that of necessity a constantly greater proportion of new oil supplies is being found at the deeper and more costly depth ranges".

In 1959, a gas well cost an average of $101,000 to drill; an oil well, $52,000. A dry hole averaged $43,000. Gas well depth averaged about 1½ times that of oil wells. Drilling costs rose steeply as wells went into the deeper ranges, for example, in productive wells of the 7500-10,000 ft depth range, it cost an average of $27.48 for each additional foot drilled. In wells of over 15,000-ft depth, however, it cost $101.50 for each additional foot drilled.

Notes of the Month

U.K. Prospecting Licences for Esso

Prospecting licences covering 1¼ million acres in thirteen specified areas in Hampshire, Surrey, Sussex, and Kent have been granted to Esso Petroleum Co. Ltd. The Company plans to start a seismic survey in the areas shortly, and if the results are favourable, a series of test drillings will be made. It is unlikely, however, that drilling will start before next year.

The areas concerned are believed to be geologically similar to, and an extension of, the Paris Basin in Northern France, where conditions are believed to be favourable for commercial oil and gas deposits.

Anglo-American Oil Co. Ltd, as Esso Petroleum Co. Ltd was then known, drilled wells between 1936 and 1947 in England, Scotland, and Wales, all of which were dry holes except one at Dalkeith, which is still a small producer.

The thirteen areas in South-east England in which the Esso Petroleum Co. Ltd will soon start oil search operations

Eire's First Well to be Drilled Soon

Irish Ambassador Oil is understood to be planning to drill its first well in Eire before the end of the year. The proposed site is in County Meath and the well is expected to reach 5000 ft.

The Company recently completed a year of geophysical and geological work in the Republic. If the Irish Government gives its approval, they will be joined in future oil search operations by Continental Oil Co. and Ohio Oil Co.

Major Discovery in Bolivia

Gulf Oil Corporation has announced what appears to be a major oil discovery in Bolivia. A well on the nearly 10-mile long Caranda Structure has been tested at a rate of 1570 bd of 51° gravity oil through a ½-in choke from a total depth of 3600 ft. A very thick oil sand is present in the interval tested, and although the total thickness has not yet been determined, it is reported to be over 100 ft.

The Caranda Structure is in Eastern Central Bolivia, about 30 miles northwest of the city of Santa Cruz on a 1¼ million-acre block held by Gulf.

Drilling in Pakistan

With drilling still continuing, Pakistan Shell Oil Co. Ltd's Rasidpur No 2 recently passed 14,340 ft to become the deepest well ever drilled in East Pakistan.

Other drilling news from Pakistan at the time we went to press was that Dasori Test Well No 1, a joint venture by Pakistan Petroleum Ltd and Pakistan Sun, had reached 11,150 ft without any shows of oil or gas. Attock Oil Co. Ltd's Dhulian No 41 was down to 9330 ft; Pakistan Oilfields Ltd's Tanwin No 1 had reached 4745 ft, while Dhulian Nos 1 and 2 were at 9857 ft and 600 ft respectively.

ICI's Crude Oil Distillation Plant

ICI's proposal to build an oil distillation plant on Tees-side means that its Heavy Organic Chemicals Division will be handling crude oil in its petrochemicals operations for the first time.

The plant will produce about half of the light naphtha feedstock required for the Division's three olefin plants at the Wilton works, only two miles away. The other products of the plant will be marketed by Shell-Mex and B.P. Ltd, the company which now supplies the light naphtha feedstock for Wilton and will also supply the crude for the new plant.

The plant will have a capacity of 1 million tons of crude oil a year. It will be able to process a variety of crudes, and design allows the end products to be varied. It is being built on part of a site of 250 acres of reclaimed land purchased from the Tees Conservancy Commission. It will be linked to the ICI works at both Wilton and Billingham by the existing pipeline system which runs adjacent to the site. A new river jetty is being built to handle the incoming crude and some of the outgoing products.

The cost of the plant has not been disclosed, but it will certainly run into several million pounds.

Maleic Anhydride Plant for Wilton

The Heavy Organic Chemicals Division of ICI is also to construct a 10,000 tons year maleic anhydride plant at the Wilton Works on Tees-side as a further step in the utilization of the butenes obtained from the olefin plants at Wilton.

Maleic anhydride is used in the production of resins for reinforced plastics and surface coatings and in the preparation of agricultural chemicals, insecticides, and other derivatives, and the new plant will use a new process in which butene is oxidized with air.

Haifa Refinery Expansion

Big developments planned at Haifa refinery include the spending of I£4 million to reactivate one of three cracking and distilling units which has been idle since the end of the British mandate. The refinery, which is owned by Consolidated Refineries Ltd, is operating at only 40 per cent of its potential capacity at the present time.

In addition, an American, a Latin American, and two Israeli groups are planning to invest $16 million in four new petrochemical plants on sites near the refinery. Among the products they will produce will be carbon black, ethylene, and polyethylene. They are expected to start up in two years time.

Kenya Refinery Construction to Start Soon

Three firms are understood to be preparing tenders for the proposed Kenya refinery at Changamwe, Mombasa, in which Shell Petroleum Co. Ltd and the British Petroleum Co. Ltd will each have a fifty per cent interest. A new company, East African Oil Refinery Ltd, is being formed to operate the refinery, which will have a 37,000 bd capacity.

Construction work is expected to start before the end of the year, and completion is due in 1964.

Work Starts on South Wales Chemicals Complex

Site clearance has already started for the new chemicals complex which British Hydrocarbon Chemicals Ltd is to build on a 400-acre site at Baglan Bay in South Wales.

The new works is expected to start up toward the end of 1962. Initial operations will be based on a steam cracker producing ethylene, propylene, and butadiene from a light distillate obtained from BP's Llandarcy refinery, which is only 3 miles away. The ethylene will be used in other plants on the same site in the manufacture of ethylene dichloride and styrene monomer, while the butadiene will be sold direct to manufacturers of synthetic rubber and other copolymers. Other products are still in the planning stage.

Forth Chemicals Ltd, which is jointly owned by BHC and Monsanto Chemicals Ltd, will be responsible for the building of the styrene monomer plant. Other contractors include Stone and Webster Engineering Ltd, who will erect the ethylene plant and the butadiene extraction unit, and The Lummus Co. Ltd, who have been awarded the contract for the ethylene dichloride plant.

I.C.I. Enters Common Market

Imperial Chemical Industries Ltd has decided to begin manufacturing operations on a substantial scale within the European Common Market. If negotiations now under way are completed satisfactorily the Company will build petrochemicals plants on a 300 acres site near Rotterdam, and construction will begin early next year. Development over the next ten years is likely to cost £100 million.

The decision to establish a major chemical works in Rotterdam as well as units elsewhere in the EEC area is part of I.C.I. plans for a vigorous drive for chemical business in Western Europe. It is understood that it does not mean there will be any relaxation in efforts to increase exports from the U.K.

Oil and the Australian Economy

Capital investment by the major marketing and refining companies in Australia amounts now to approximately £321 million of which £186 million has been spent in establishing nationwide distributing facilities, and £135 million on the erection of seven modern refineries.

Petroleum Information Bureau (Australia) figures show that the total capital investment on marketing and refining in the Continent rose in 12 months by more than £42 million.

The industry provided employment during the year for more than 32,000 persons and paid out salaries, wages, and commission amounting to nearly £36 million. Expenditure in all phases of the industry's operations amounted to £342 million.

The New Dundee Oil Depot

The new Dundee Oil Depot, which Scottish Oils and Shell-Mex Ltd opened recently, cost some £300,000 to build and stands on 5¾ acres of reclaimed land on the eastern side of Dundee Harbour. A 500-ft tanker jetty stretches out into the Tay to accommodate the coastal tankers which will sail in from BP's Grangemouth refinery. The jetty can handle vessels up to 1200-dw tons, and it carries two 8-in and two 6-in pipelines through which the products flow into the storage tanks. A fifth pipeline carries water to visiting vessels.

In the tank compound there are thirteen vertical and ten horizontal tanks with a total capacity of 3 million gallons. They provide storage for six different grades of Shell and BP motor spirit, three grades of kerosine, gas oil, Derv fuel, and fuel oil. Lubricating oil is stored in two multi-compartment elevated horizontal tanks.

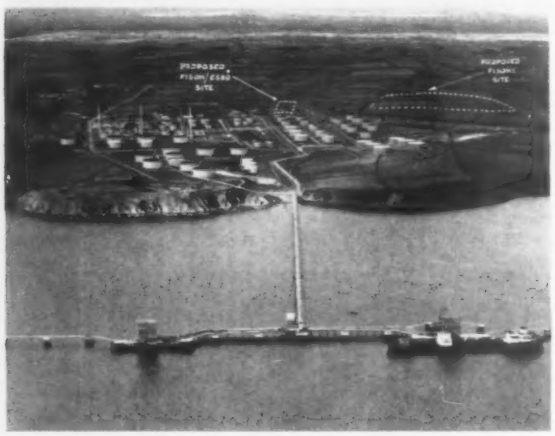
The road tanker filling gantry can handle eight vehicles simultaneously. Fifteen of the sixteen spring balanced filling arms for dispensing products are equipped with flowmeters, output indicators, pre-set mechanism, and automatic cut-off. Thirteen centrifugal pumps can fill the road tankers at rates varying from 250 to 500 gal min.

A view of the new Dundee Oil Depot which replaces the former Scottish Oils and Shell-Mex Ltd depot at Riverside Drive

Esso Fisons Ammonia Plant at Milford Haven

Esso Petroleum Co. Ltd and Fisons Ltd have formed a new joint company to produce 150,000 tons year of ammonia in a new plant on a 5-acre site adjacent to Esso's Milford Haven refinery.

Construction of the new plant, which will cost about £4 million, will begin shortly. The ammonia from the plant will be supplied by pipeline to another new wholly-owned Fisons nitrogen products plant, which is to be built on a nearby 40-acre site. Esso will be responsible for operating the ammonia plant on behalf of the joint company, and it is expected that both plants will be commissioned by the Spring of 1964.



An aerial view of Milford Haven showing the proposed sites for the new ammonia and nitrogen products plants which are to be built adjacent to the Esso refinery

Pipeline Over the Brahmaputra

One of the biggest problems involved in the construction of the 720-mile Oil India Private Ltd pipeline in Northern India (*IP Review* March 1961) has been solved by the Government decision to allow it to cross the Brahmaputra river by the road and rail bridge which is being built between Pandu and Amingaon.

The original intention was to make the crossing by means of a 4800-ft wide suspension bridge, which would have cost Rs 1 crore to construct. There are seventy-eight rivers on the pipeline route. Thirty-two of them are so far scheduled to be crossed by existing railway bridges.

Automation Speeds Loading at Isle of Grain

Additions to road and rail facilities at BP's Kent refinery mean that more tankers can be filled in a shorter time by the same number of staff. The old system, in which the products flowed from overhead storage tanks by gravity has been replaced by a pumped system. At most loading points the operator can now select any one of a number of different products, which the meter will then deliver in exact quantity, automatically, together with a printed ticket showing the amount.

Other recent additions at Kent refinery include a new single bay road rack built to load the special boiling point solvents produced in the new plant commissioned at the refinery last year, new sidings and a large loading rack for filling rail cars with white oils or solvents, and a completely new installation for loading fuel oils into road and rail vehicles.

First Bulk Gas Exports from Aden Refinery

The first consignment of liquefied petroleum gas left the new bulk export installation at BP's Aden refinery recently in a chartered tanker. It was taken to a number of East African ports where it was bottled for local use.

Previous exports of LPG from the refinery have been made in small, bulky, and returnable containers, a method which has proved costly. The new installation involved the construction of two hortonspheres, each with a capacity of 250 tons, and pumping and jetty facilities.

Bid for Shell Trinidad

The Shell Petroleum Co. Ltd is planning to acquire a 100 per cent holding in Shell Trinidad Ltd in which it already owns 88 per cent of the shares.

Cremona Refinery Take-over

Amoco International, a Standard Oil (Indiana) subsidiary, has bought the Cremona refinery, which was previously owned by Italia, S.p.A., Raffinaria.

The American Company is forming a new subsidiary, Amoco Italia Societa per Azioni, to run the refinery and its 700 associated filling stations in central and northern Italy.

New Grange Chemicals Project

A new plant to produce 15,000 tons year of phthalic anhydride from orthoxylene is planned by Grange Chemicals Ltd. BP California Ltd will produce the orthoxylene for the Grange operations in the new plant which is to be built at Kent refinery.

Phthalic anhydride is used to make phthalates, which are used as plasticizers for polyvinyl chloride and other plastic resins, alkyd resins for paints, and polyester resins for glass fibres. Until recently it has been manufactured from naphthalene.

Impact of the St Lawrence Seaway on the Freight Market

The St Lawrence Seaway opened for its third season at the end of April. Its impact on the freight market, the extent to which tramp employment in the area has been widened, and the role of overseas trade in Seaway traffic is discussed in Westinform Shipping Report No 176.

Although full statistics for the second season of operation were not available at the time of writing, there is a primary trend towards more down and less up-bound traffic. The report contains an analysis of the problems which have faced the owners of deep-sea vessels trading in the Lakes and concludes by considering whether the area will continue to increase in importance as a source of tramp employment.

Copies may be obtained from W. G. Weston Ltd, 26–27 Cockspur Street, London, S.W.1, at a cost of £2 each (postage extra).

First Iranian Oil Exports to Afghanistan

The first consignment of oil products to be exported to Afghanistan under a new Iran-Afghan agreement left Meshed recently in five road tankers. They carried 29,000 litres of gasoline, 14,500 litres of kerosine, and 14,500 litres of gas oil. The agreement covers total exports of 17,000 tons a year.

The Middle East Association

The executive committee of the newly incorporated Middle East Association held its first formal meeting recently at which Sir Neville Gass was elected chairman, and R. M. Wynne-Edwards, a managing director of Constructors John Brown, was elected vice-chairman. The Association, which is non-political, has been formed to promote mutual trade relationships between Great Britain and the Middle East.

The Association is hoping to obtain permanent headquarters in the West End of London but at present has temporary accommodation at River Plate House, Finsbury Circus, London, E.C.2.

Novel Method for Transporting Lubricants

Lubricants are shipped from BP Australia Ltd's Spotswood blending plant near Melbourne to Tasmania in rubber bags, but before they are filled the bags are put into metal crates.

This novel method of oil transportation is made necessary because the steel crates are standard equipment on the local cargo carrying ships. After the lubricants are discharged, the bags are all packed into one crate, leaving the others free to carry other cargoes.

Shell Aids Anaesthetics Research

Collaboration between scientists of the Thornton Research Centre of "Shell" Research Ltd and the Royal College of Surgeons has resulted in the development of equipment that is capable of analysing the breath of a patient under an anaesthetic in half a minute. It is expected to enable the administration of anaesthetics to be controlled to a considerably finer degree than at present.

The equipment is based on the technique of analysis known as gas chromatography. In this, a minute sample of the gases to be analysed is injected into one end of a long tube containing special chemicals and emerges at the other end as separated gases which can be quickly identified and measured.

So far the technique has only been used on experimental subjects in the laboratory but a full-scale trial in an operating theatre is expected to be made soon.

This prototype of the new anaesthetic analyser was made by the British Oxygen Co. Ltd. It is about the size of a table television set, but further developments should enable it to be reduced so that it can fit neatly on to an anaesthetist's trolley

Record Australian Energy Consumption

Figures released recently show that in the year to June 30 1959 Australian consumption of petroleum products, black coal, brown coal, and hydro-electricity, expressed in terms of equivalent black coal tonnage, exceeded 40 million tons for the first time. This represented an increase of six per cent over the previous year's consumption and was the greatest yearly increase since 1954–55 when demand rose by seven per cent.

Petroleum products met 38·9 per cent of the total demand for primary energy, black coal met 46·5 per cent, brown coal 9·3 per cent, and hydro-electricity 5·3 per cent.

The Corday-Morgan Medal and Prize

The Council of the Chemical Society has awarded the Corday-Morgan Medal and Prize to Dr A. R. Battersby, lecturer in chemistry at the University of Bristol, for his work on the stereo-chemistry of emetine and its congeners, and also his contributions to the chemistry of curare alkaloids and the biogenesis of papaverine.

The award consists of a silver medal and a monetary prize, and is made annually to the chemist who is under thirty-six years of age and of British nationality who is considered to have published the most meritorious contribution to experimental chemistry.

Waverley Gold Medal Competition

For the ninth year in succession, *Research* is sponsoring The Waverley Gold Medal Essay Competition. The Medal, together with £100, will be awarded for the best essay of about 3000 words describing a new project or practical development in pure or applied science, giving an outline of the scientific background, the experimental basis and the potential or actual application of the idea to industry or its importance to society.

There will be a second prize of £50 and also a special prize of £50 for the best entry from a competitor under the age of thirty on 31 July 1961. Entry forms can be obtained from the editor of *Research*, 88 Kingsway, London, W.C.2.

ASTM'S GAS CHROMATOGRAPHY COMMITTEE

The American Society for Testing Materials has formed a new committee to promote the development and application of gas chromatography. It will be officially known as Committee E-19 on Gas Chromatography.

At its first meeting, held in Philadelphia recently, the committee defined as its aims: Co-ordinating scientific applications and methods of analysis based on gas chromatography in co-operation with other technical committees of the Society and other organizations. Co-operating with national and international bodies in standardizing presentation of data and nomenclature. Developing general methods and other appropriate standards. Providing a forum for exchange of information. Stimulating research in this field. Collecting and disseminating critical data.

At its next meeting in Chicago on 9 June, the committee will hold a forum with a panel of experts on the subject of nomenclature, definitions, and standard data.

Personal Notes

George Noble

George Noble, O.B.E., M.Inst. Pet., a director of Esso Petroleum Co. Ltd since 1953, has retired. Mr Noble held a number of responsible positions with the Esso Group of Companies over the past 31 years, including appointments at the Sarnia refinery and Fawley refinery, where he became refinery manager in 1947. Prior to his appointment to the board of Esso Petroleum Co. Ltd, he had been general manager (refining) since 1952.

J. A. Drysdale, M.Inst. Pet., has become a director of The Burmah Oil Co. Ltd. He joined the Company in 1931 and, apart from four years spent in the army, served with the Group's operating companies in Burma and India until 1946, when he was appointed to the London office, becoming a director of subsidiary companies in 1951.

St. John de H. Elstub, C.B.E., has been appointed chairman of the Metals Division of Imperial Chemical Industries Ltd in succession to **M. J. S. Clapham,** who has joined the Company's main board as an overseas director.

Mr Elstub spent the three years up to 1939 as an engineer with I.C.I. Billingham Division. After war service he rejoined I.C.I. as a deputy chief engineer of the Metals Division. He was appointed to the Division board in 1951, but later in the same year was seconded as director in charge of Summerfield Research Station. He resumed full-time board duties in 1952, and was appointed joint managing director in 1957. Mr Elstub is also chairman of Amal Ltd, and Yorkshire Imperial Metals Ltd.

Dr William Henry George Lake, O.B.E., has been appointed joint managing director (technical) of the Metals Division of I.C.I. in succession to St. J. Elstub. Dr Lake joined I.C.I. Dyestuffs Division in 1940 and was transferred to the Research Department of I.C.I. Metals Division three years later. Between 1943 and 1952 he was engaged in work on behalf of the Government's atomic energy project. He was appointed assistant research manager of I.C.I. Metals Division in 1952 and a year later took charge of the team responsible for the construction and commissioning of the commercial-scale titanium melting plant at Witton. He was appointed a director of I.C.I. Metals Division in 1957.

E. W. A. Jefferies has been appointed marketing services manager of Regent Oil Co. Ltd, in succession to **R. A. Munro** who transferred recently to the Caltex affiliated company in The Hague Mr. Jefferies was previously publicity manager of Bakelite Ltd.

E. W. A. Jefferies

E. B. Bishop has been appointed secretary of Metal Cleaning Ltd, a member of the Castrol Group of Companies. He succeeds **G. J. B. Williams** who will concentrate on reorganization and sales development. Both Mr Bishop and Mr Williams are directors of Metal Cleaning Ltd.

J. G. Hill has been appointed works manager at the British Hydrocarbon Chemicals Ltd factory which is under construction at Baglan Bay, with effect from 1 July. Mr Hill has been plant manager of Forth Chemicals Ltd at Grangemouth since 1951 and prior to this was maintenance manager for Monsanto Chemicals Ltd at Ruabon, for five years.

Captain C. W. G. Stook

Commodore R. G. Mott

Captain C. W. G. Stook has become Commodore of the BP Tanker Company in succession to **Commodore R. G. Mott,** O.B.E., who has retired after more than 37 years' service with the Company. Captain Stook joined the Company in 1918 as a navigating apprentice and obtained his first command in 1936. He was appointed a Senior Post Master in 1957 and recently took command of the 50,000-dw ton *British Queen*.

William Reid has retired from executive duties at The Distillers Co. Ltd and has been succeeded as chairman of the management committee by **T. F. A. Board,** while **H. H. Woolveridge** has been appointed to the management committee.

E. G. Gross, a director of the Company, has been appointed a resident director in Australia.

P. D. Mitchell has been appointed technical sales manager of Polypenco Ltd. Prior to joining the Company in 1958, he was a planning engineer with The de Havilland Aircraft Co. Ltd. **E. Smedley** has been appointed manager of the Company's sales office.

N. Loring Bowen, Jr has been elected secretary-treasurer of Scientific Design Co. Inc. He was formerly in the Law Division of American Cyanamid Company, and served as secretary and general counsel of Chemical Construction Corporation.

H. W. G. Hignett and **Jean M. Dhavernas** have been appointed directors of The International Nickel Co. (Mond) Ltd. Mr Hignett will remain managing director of Henry Wiggin and Co. Ltd. Mr Dhavernas, who is located in Paris, has been concerned with nickel markets on the Continent for many years.

J. W. Atwell, M.Sc., has become an additional director of G. & J. Weir Holdings Ltd of Glasgow. He is also managing director of the principal operating subsidiary company of the group, G. & J. Weir Ltd.

Wallace Clarke has been promoted shipping and traffic manager of F. Perkins Ltd, Peterborough, and has been succeeded as assistant company secretary by **Hugh John Wynne.**

G. W. Ivey has retired from the boards of Kern Oil Co. Ltd and its associated companies of which he had been chairman since 1934.

Gustave F. Wunder has been made general manager of Procon (Great Britain) Ltd. Mr Wunder joined the American parent company, Procon Incorporated, in 1952 as a co-ordinating engineer and was made chief engineer in 1960.

Dr Hugh B. Ogburn has been named manager of the Process Engineering Department by The M. W. Kellogg Company, New York.

Dr Ogburn, a graduate of Princeton University, was formerly director of the Mathematics and Kinetics Section of the Research and Development Department of the Atlantic Refining Company. He is an authority on the application of computers to scientific and business problems.

D. K. Fraser, A.F.Inst.Pet., joint managing director of G. A. Harvey & Co. (London) Ltd, has been appointed managing director.

H. E. Cooper has relinquished his post of joint managing director but remains a director of the Company.

R. E. J. Putman, A.M.I.Mech.E., has rejoined James Gordon & Co. Ltd as chief engineer after spending several years in England and Canada engaged on the application and development of electronic control equipment and systems for power stations, sugar factories, oilfields, etc.

F. R. Allen, an executive director of Firth Cleveland Instruments Ltd, is, in addition to his other responsibilities, now in charge of the Company's Sales Engineering Department.

Ivon A. Bailey has been elected a vice-president and **John O. Hitchcock** an assistant vice-president of The International Nickel Company of Canada Ltd.

Mr Bailey is chairman and chief officer of the International Nickel Company (Mond) Ltd and of Henry Wiggin and Company Ltd, both of which positions he will retain. Mr Hitchcock will remain managing director of The International Nickel Company (Mond) Ltd and deputy chairman of Henry Wiggin and Co. Ltd. He will also continue as second chief officer of both companies.

J. W. Haig-Ferguson, M.A., A.M.I.Mech.E., A.M.I.E.E., A.M.I.Prod.E., was recently appointed managing director of R. & J. Beck, Ltd, one of the Griffin & George Group of Companies.

R. P. Newman, A.M.I.Mech.E., has been appointed head of the Members' Service Department of the British Welding Research Association in succession to **P. H. R. Lane,** who has been appointed director of research of the Drop Forging Research Association. **T. R. Gurney,** M.A., A.M.I.C.E., will succeed Mr Newman in charge of fatigue researches at the British Welding Research Association.

R. Strick has retired from partnership in Rendel, Palmer, & Tritton, but will continue to be associated with the firm as a consultant. **J. Cuerel** has assumed the duties of senior partner, and **F. Irwin-Childs,** M.I.C.E., and **P. M. Fraenkel,** M.I.C.E., M.I.Struct.E., have been taken into partnership.

We record with regret the death of **Tom Martin,** F.I.R.I., chairman of The Anchor Chemical Co. Ltd. Mr Martin, who joined the Company in 1914, had been a director for 38 years and chairman since 1956.

Anthony M. Browne, B.Sc., A.R.C.Sc.I., has been elected president of the British Electrical and Allied Manufacturer's Association, and **H. H. Mullens,** B.Sc., M.I.E.E., has been elected deputy president.

Mr Browne is chairman and managing director of Hackbridge and Hewittic Electric Co. Ltd and chairman of Combined Electrical Manufacturers Ltd. Mr Mullens is chairman and managing director of A. Reyrolle & Co. Ltd and chairman of C. A. Parsons & Co. Ltd.

E. Jarman

E. Jarman, M.I.Mech.E., F.Inst. Pet., has been appointed technical adviser to the Council of British Manufacturers of Petroleum Equipment. Mr Jarman has been head of the Mechanical Engineering Division of the Kuwait Oil Company in London since 1947. He joined the Anglo Iranian Oil Company in 1930 as a construction engineer at Masjid-i-Sulaiman and later held a number of other appointments in the Middle East before joining the London office of the Kuwait Oil Company in 1947.

James Oldroyd, T.D., M.A., F.C.I.S., who has been secretary of The British Electrical and Allied Manufacturers' Association since 1952, has been appointed general manager of The Lead Development Association.

The Institution of Works Managers has elected three new vice-presidents. They are **E. J. Hunter,** chairman of Swan, Hunter & Wigham Richardson Ltd; **J. R. Edwards,** managing director of Pressed Steel Company; and **The Hon. Geoffrey Rootes,** deputy chairman and managing director of Humber Ltd.

W. Fletcher has been appointed sales manager of the stainless steel plant of A. Johnson & Co. (London) Ltd. Mr Fletcher was formerly with Constructors John Brown Ltd where he was a senior chemical and project engineer.

Brian G. Robbins, M.Sc.(Eng.), F.C.G.I., M.I.Mech.E., who was appointed Secretary in 1951, is taking an early retirement from The Institution of Mechanical Engineers.

Kenneth H. Platt, M.B.E., B.Sc., M.I.Mech.E., will succeed Mr Robbins from 1 June 1961. He is at present deputy secretary of the Institution. He was educated at Shrewsbury School and the University of Glasgow, where he graduated B.Sc. with First Class Honours in Mechanical Engineering. After gaining experience in industry, he became a lecturer in mechanical engineering. He joined the Institution staff in 1952, was appointed assistant secretary in 1953 and deputy secretary in 1956.

Branch of the Month Feature

The Shell Refining Company's South Refinery, Stanlow, a familiar sight to members of the Branch

The Stanlow Branch

From East to West, bordering on the Manchester Ship Canal, lie the village of Ince, the area of Stanlow, and the town of Ellesmere Port, the partly wooded prominence of Ince overlooking the flat countryside. Ince derives from the Celtic, *Ynys*, an island, which is descriptive of its position in olden times as an eminence surrounded by marshland. To-day the huge oil centre at Stanlow sprawls across the former marshland, overlooked by "Shell" staff housing on the slopes of Ince.

Ince figures in the records, as far back as the tenth century, as habitable land. Stanlow was marshland with, to the North, Stanlow Point jutting out into the River Mersey. On this Point a Cistercian monastery, Stanlow Abbey, was founded in 1178 by John, Baron of Halton and Constable of Chester. From the Abbey the monks built and maintained a road across the marshland to their farmhouse at Stanney. The monks became dissatisfied with the bleak, miserable situation of the Abbey. About 1279, storms and fire destroyed the major part of the Abbey. It became a mere cell of Whalley Abbey and only four monks were compelled to remain in the wilderness. A fitting site for the establishment of an oil industry.

The main dormitory of the Stanlow area is the Borough of Ellesmere Port. The "Port" dates back to 1795 when a canal linking Ellesmere with Chester was completed. This gave access to Whitby Locks on the River Mersey thus giving the manufacturing districts of the Midlands and the Potteries an outlet by water to the sea. As the port of Ellesmere developed the name of Ellesmere Port gradually came into general usage in place of Whitby Locks.

The Oil Industry Comes to Stanlow

The completion of the Manchester Ship Canal in 1894 gave an impetus to the development of Ellesmere Port which was ideally situated on this Canal. Another two decades were, however, to pass before development extended to the Stanlow area. The first world war during this period emphasized the importance of the oil industry. Deriving from this, Government interest resulted in oil docks being built alongside the Manchester Ship Canal on the "bleak, miserable situation" of Stanlow Point. The Point had been separated from the olden times marshland by the Canal and it was thus necessary to dig a tunnel under the Canal to carry the pipelines feeding the oil installations which grew up on the former marshland. This was an engineering feat at the time of its construction in 1920/21. The opening of the Stanlow Oil Docks followed in November 1922.

The initial development of the Stanlow area was for oil storage in the form of installations. The situation, close to the industrial area of Lancashire, was ideal for such purposes, and Esso, Shell, British Mex, National Benzole, Cleveland, and Berry Wiggins erected storage facilities.

In 1924 came the first appearance of the refining industry when "Shell" constructed distillation units for the manufacture of bitumen and special boiling point spirits.

In 1934 Lobitos Oilfields Ltd carried this a stage further by constructing and bringing into operation a refinery to manufacture from crude oil all products from motor spirit to bitumen, the first full range refinery in the U.K. This proved of service during the second world war when

Lobitos processed for a full range of products all the crude oil produced in England.

The Second World War and After

In 1941 the Thornton Aero Engine Laboratory was built and brought into operation by Shell. The services of this research laboratory were offered to the Ministry of Aircraft Production and became the M.A.P. Fuel and Oil Research and Development Laboratory. The building reverted to the Shell Group in early 1946 and has continuously expanded along the lines of oil products research and application.

During the war there was Government interest in the development of refining, particularly aviation benzine, on the Shell site but this progressed little further than the foundation stage. Shell were at that time equipped to

A general view of the Lobitos refinery in 1935, *and . . .*

manufacture a full range of products on, for them, a comparatively small scale. After the war Shell planned forward towards their present day large scale operations based on catalytic cracking to provide the necessary gases for chemical manufacture. Brought into operation in 1952, there has been continual expansion to cover the manufacture of the great variety of oil products and chemicals now available from this refinery.

With this continual rise in the scale of manufacture, now millions of tons/year, the Stanlow Oil Docks became inadequate to handle either the required tonnage of crude oil or the size of the post-war tankers designed to handle it. Primarily for these larger tankers the M.S.C. built and brought into operation in 1954 the Queen Elizabeth II Dock at the entrance to the Manchester Ship Canal at Eastham. Tanker design, based on higher and higher capacities, soon placed the latest models outside the range of the Queen Elizabeth II Dock and a further dock was built in deep water at Tranmere. This joint venture of Shell and the Mersey Docks and Harbour Board, the Tranmere Terminal, was opened in 1960.

This oil dock development reflects the similar rapid and great development of the Stanlow area as an oil refining and distribution centre.

Before the war, Metal Containers had established a drum factory in the Stanlow area to meet local drum requirements and Colas operated a small plant to manufacture its product.

After the war other companies were attracted to the area. Castrol who had been bombed out in Liverpool built their new factory alongside Lobitos, Cabot Carbon came over from the U.S.A. to erect a plant, which has since been tripled in size, for the manufacture of carbon black; and Associated Ethyl built and brought into operation plant for the manufacture of tetraethyl lead, later adding additional plant for the manufacture of the required basic chemicals.

Such is the background to the operations of the Stanlow Branch, a wealth of varied interests in petroleum.

The Branch is Formed

In the April issue of the *IP Review* a description was given of the origin and development of the Northern Branch. This was formed in 1936 with its base in Manchester and planned to cover the requirements of the North of England. The Stanlow area was included in its scope and Stanlow representatives took part in its meetings and had members serving on its Committee.

With the outbreak of war, Branch activities ceased. Stanlow being a concentrated community decided to carry on and actually did so throughout the entire war period. This first took the form of the Stanlow Section of the Northern Branch, the Inaugural Meeting taking place on 13 March 1940. It is of interest to note from the minutes of the Committee Meeting on that date that "The Committee considered the question of the first open meeting. It was agreed that the date should, if possible, coincide with that of the full moon——". Forward planning in those days was certainly based on different principles to those existing today.

The Stanlow Section was founded by J. S. Parker with eighteen members, the Committee as then constituted being J. W. Vincent, G. Davidson, G. W. Dorrell (Shell), A. Evans (Esso), D. M. Glendinning, J. S. Parker, and J. C.

. . . The same view to-day showing the additions which have been made since then

Wood-Mallock (Lobitos). J. S. Parker was elected chairman and J. C. Wood-Mallock hon. secretary.

Two months later the Section became an independent Branch. Dr A. E. Dunstan, Past President, was largely instrumental in furthering its formation and attended its first open meeting on 3 May 1940 when he read a paper on "The Utilization of Refinery Gases". Also present on this occasion were J. A. Oriel, Member of Council, A. McCulloch and J. E. Haslam, chairman and hon. secretary of the

Northern Branch, and S. J. Astbury, secretary of the Institute.

By November 1940, the membership stood at 88, 51 Corporate and 37 Branch members. There were, in addition, 28 applications for Branch membership bringing the total to 116.

Nostalgic memories of these days are the "Grace Arms" and the "Grosvenor Hotel", typical English pubs, where a mug of beer provided fitting solace whilst the British and the Germans were locally exchanging their supplies of scrap iron. The proprietor of the "Grace Arms" provided the accommodation free of charge but later, through the increase in lighting and cleaning charges, found it necessary to make a charge of 10*s* per night.

The holding of joint meetings with other scientific societies has always been a feature of the Stanlow Branch activities. This was first discussed in 1944 but because of transport difficulties could not be furthered until May 1948. Contacts were then made with the Society of Chemical Industry, and C. D. Brewer, then chairman of the Stanlow Branch, attended a meeting of the Liverpool Joint Chemistry Committee from which arose the inclusion of the Stanlow Branch of The Institute of Petroleum in the arrangements for joint meetings with other scientific societies in the Liverpool/Chester area. The first joint meeting was held on 15 December 1949 when a lecture on "Operational Research in Industry" was given by R. E. Strong before an audience from the Liverpool Sections of the Royal Institute of Chemistry and the Society of Chemical Industry.

When H. Pracy left Stanlow to take charge at Heysham arrangements were made to include Heysham in the Stanlow Branch. Stanlow provided a meeting at Heysham toward the beginning of each new session and Heysham sent bus parties to Stanlow for lectures of interest to their personnel.

No doubt the monks, despite their miserable existence in the wilderness, imparted knowledge to the local inhabitants. So it is probably fitting that after their passing, another body, the Stanlow Branch of The Institute of Petroleum, should perform a similar function in imparting knowledge to the employees of the vast industry which has replaced the monastery on Stanlow Point.

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Lectures, Courses, and Conferences

Spectroscopic Studies

The Applied Spectroscopy Group and Manchester and District Branch of The Institute of Physics and the Physical Society will be holding a joint one-day meeting on "Spectroscopic Studies Using Time Resolution Techniques" on 16 June 1961 in Manchester, at which seven papers will be presented.

Details are available from the Administration Assistant of the Institute and Society at 47 Belgrave Square, London, S.W.1.

Radiation Protection

A Summer School in Health Physics (Radiation Protection), arranged by Hugh D. Evans, B.Sc., Ph.D., A.Inst.P., lecturer in radiation hazards and health physics, will be held in the Department of Chemical Engineering and Chemical Technology, Imperial College, from 3–14 July 1961. The fee is 25 guineas. Details are available from the Registrar, Imperial College, South Kensington, London, S.W.7.

Engineering Inspection and Non-Destructive Testing

A National Conference on Engineering Inspection and Non-Destructive Testing is to be held at Queen's College and New College, Oxford from 5–8 September 1961 to discuss the function of management in relation to inspection, the economics of inspection and non-destructive testing, and the recruitment, education, and training of inspection staffs.

The total cost will be £9 10*s*. per delegate, and will include Conference fee, accommodation, and all meals in College. Further information is available from the Oxford Conference Secretariat, The Institution of Engineering Inspection, 616 Grand Buildings, Trafalgar Square, London, W.C.2.

Radio Spectroscopy of Solids

The Institute of Physics and The Physical Society and the British Radio Spectroscopy Group are holding a joint two-day conference on "Radio Spectroscopy of Solids" in the Department of Physics of the University College of North Wales, Bangor, on 21–22 September 1961. During the Conference, Dr D. Shoenberg, F.R.S., will present the Institute and Society's Guthrie lecture. His subject will be "The de Haas-van Alphen Effect and the Electronic Structure of Metals".

Further details are available from the Administration Assistant, The Institute of Physics and The Physical Society, 47 Belgrave Square, London, S.W.1.

Maintenance Conference and Exhibition

A four-day National Maintenance Conference and Exhibition organized by *Plant and Factory Maintenance* will take place at the Central Hall, Westminster, 13–16 November 1961.

The conference will deal with all facets of the maintenance manager's work and discussion groups will give the opportunity for frank exchange of views.

Chemical Society Symposia

Three symposia will be held in conjunction with the Anniversary Meetings of the Chemical Society to be held in Sheffield from 3–5 April 1962. The subjects will be "Some Aspects of the Chemistry of Natural Phenols", "Reactivity and Structure in Inorganic Chemistry", and "The Transition State".

Further details will be available in December 1961 from The General Secretary, The Chemical Society, Burlington House, London, W.1.

Salon International de la Chimie

The VI[e] Salon International de la Chimie and the Conference Internationale des Arts Chimiques which were to be held in June 1962, will now take place from 25 April to 4 May 1962, at the Centre National des Industries et des Techniques, Rond-Point de la Défense at Puteaux-Paris. Further information can be obtained from the General Secretariat, 28 rue Saint-Dominique, Paris VII[e].

Correspondence

THIS AGE OF OIL

To the Editor, the *Institute of Petroleum Review*

Sir,

May I say that I agree with your book reviewer (*IP Review*, February) that the recent publication of *This Age of Oil* by the Petroleum Information Bureau (Australia) in Melbourne, is a credit to the Bureau and the Australian oil industry, except in one very important aspect?

The main object of the PIB (Australia) is, as the reviewer notes, to provide the Australian public with authoritative oil industry information. Since one historically important section of the publication does just the reverse of that, I would ask your readers whether this does in fact "create a better understanding of the industry in the community".

Section 11 of this book is entitled "Alternative Fuels" and refers mainly to the mineral oil industry of New South Wales which no longer exists, and the extraction of oils from the cannel coals and/or shales of that State. Two very excellent photographs are used to add interest to this section, and one of these is a portrait of a mid-nineteenth century gentleman from Scotland. He is described as having pioneered the industry here beginning in 1852. It appears that he and James Young of Scotland had, for many years before 1852, been joint pioneers of the oil shale industry that had flourished in Scotland. The fact that James Young took out his first patent in October 1850 and built his first plant at Bathgate to extract paraffin oil and wax, etc., from Boghead cannel coal in 1851, and did not handle the oil shales until a decade or more later seems to throw some doubt on the PIB story.

However, we do not wish to condemn this out of hand. Reading further we find that the date of 1852 refers to the year when this pioneer partner of James Young first arrived in Australia after many months of adventure in Ceylon, where he turned his back on the failing markets for coffee and loaded a vessel with this commodity and sailed for Sydney. He apparently left Scotland before Young built the Bathgate works. Moreover, before 1851 Young had not been in Scotland for a number of years. Hence this "pioneer of the oil shale industry in Scotland" could only have been associated with Young before he went to London in 1837 and at that time he knew nothing about oil shale.

The PIB (Australia) story then relates how this pioneer, in 1852, lost no time in forming a company with himself as managing director, went back to Scotland to tell them he had discovered oil shale in Australia, then filled two sailing ships with workmen and their families and all the plant necessary to build homes for them and was back with it all in Australia so quickly that not only the homes but the plant for a works had been installed at Hartley Vale by the end of 1854 when "the retorting of oil shale began"

This story not being fantastic enough, the reader is informed that "the market for refined products in 1854 was largely confined to paraffin wax, candles, and kerosine. So the Australian Kerosine and Oil Company at Hartley Vale produced these commodities".

Paraffin wax candles had not reached the stage of commercial production until 1857/8 in England and later in America, and as kerosine burning oil was unknown on any market in the world before 1856, when a few thousand gallons were sold in New York for the first time, it was quite impossible that the market in 1854 in New South Wales should have been "confined to these refined products" even under some other name.

This impossible story comes from an organization whose professed object is to provide the public with authoritative oil industry information. Unfortunately this object is not being confined just to the Australian public for the PIB (Australia) has just told us that this book has "gone to all continents in the world. Copies have been added to the libraries of all major seats of learning or research—among them, for example, the British Museum, the Punjab University, Pakistan, and the New York Public Library". The PIB (Australia) have also reported that "A final phase in the book's distribution is underway, with the posting of copies to every high school in Australia".

Had the PIB (Australia) been desirous of giving an authoritative history of the New South Wales oil shale and mineral oil industry they could have used the official account given by J. E. Carne, which was published as long ago as 1903 as Memoir No 3 of the New South Wales Geological Survey. Carne shows that the first company to work the mineral was formed in 1865 and that retorting and distillation commenced about 1866 at Hartley Vale by a company called Hartley Kerosene Oil and Paraffine Company. A second company commenced distillation of the shale in 1866 but refining was not done at Hartley Vale. The refining was done at Waterloo, Sydney. All this was after Young's patent had expired in 1864 of course! Scots workmen and a manager were brought out to run the first refinery in Australia around 1866, and the name of Mr Fell has been well known in the industry of New South Wales ever since.

Yours faithfully,
OWEN COLVERD.

29 Myahgah Road, Mosman,
New South Wales, Australia
5 April 1961

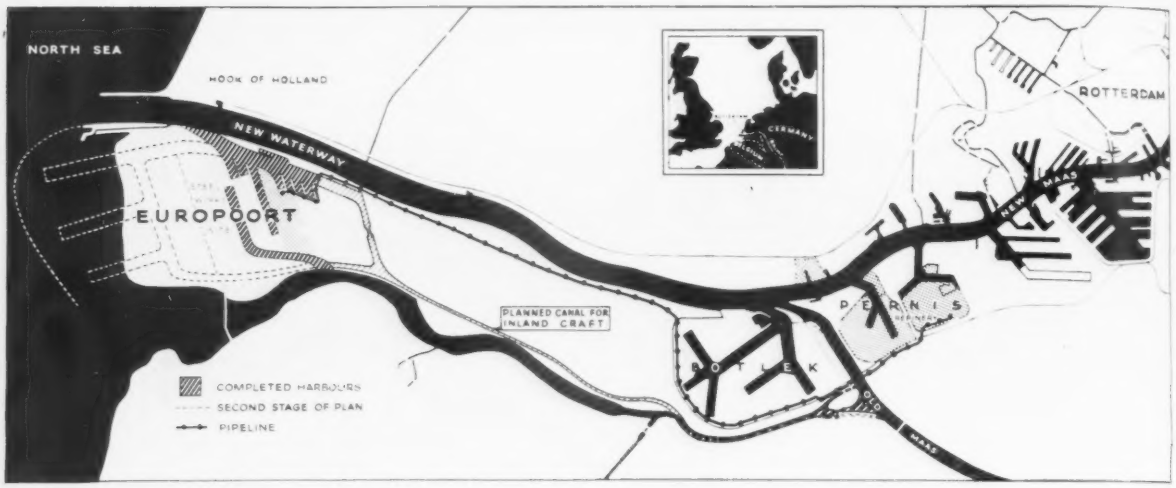
MIDDLE EAST OIL PRODUCTION

	March	*Jan–Mar*
	Tons	
Iraq Petroleum Co. Ltd ...	3,042,689	8,997,181
Basrah Petroleum Co. Ltd ...	710,415	2,391,756
Mosul Petroleum Co. Ltd ...	114,012	323,397
Qatar Petroleum Co. Ltd ...	696,639	2,037,906
Iraanse Aardolie Exploratie en Productie Mij	4,538,000	13,479,000
	Barrels	
Arabian American Oil Co. ...	45,635,833	133,493,621
Bahrain Petroleum Co. Ltd ...	1,397,610	4,056,240
Getty Oil Co. and American Independent Oil Co. (Kuwait-Saudi Arabia Neutral Zone) ..	4,741,421	13,503,613

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for March was 660,000 tons, the total for 1 January to 31 March being 3,184,000 tons.

Crude processed at Aramco's Ras Tanura refinery during March was 8,297,997 brl, the total for 1 January to 31 March being 22,355,212 brl.

The Kuwait Oil Company crude production during the first three months of 1961 averaged 1,693,862 bd.



Europoort—Gateway to Europe

Europoort was inspired by the increasing demands for oil from the great industrial areas of Europe. It was created by the vision and foresight of the Rotterdam Municipality and a vast expenditure of capital and effort, both by the authorities and by industry. To-day the Port of Rotterdam is enjoying the first rewards of this great enterprise.

With the petroleum harbours now gradually being brought into operation the first stage of the Europoort plan is almost completed.

Europoort is a complex of harbours, storage installations, and industrial sites situated at the head of Rozenburg Island, which lies opposite the Hook of Holland at the mouth of the New Waterway which leads 18 miles via the New Maas to the inner harbours of Rotterdam.

The Port of Rotterdam is the gateway to the Ruhr and Rhineland areas and is already the world's second largest port. When the Europoort development is completed, it may well come very close to challenging New York as the world's largest. In 1960, 24,300 ships called at the port and handled some 80 million tons of cargo, more than 40 per cent of which was crude oil and its products.

Building the outer wall of one of the dykes

A Great Refining Centre

Another major distinction enjoyed by Rotterdam is that it is the largest refining centre outside North America. The huge Shell refinery at Pernis, together with its extensive petrochemicals plant, has a total capacity of 15 million tons year and is the largest in Europe, while the refineries of Caltex Petroleum Mij (Nederland) and Esso Nederland N.V., which came on stream in February 1960, have throughputs of 3 million tons and 5 million tons respectively.

It was because the new supertankers then under development could not use the New Waterway to reach the three petroleum harbours which serve these refineries that the famous Dutch engineer, Dr Johan van Veen suggested that new harbours should be built at the mouth of the river on Rozenburg Island.

With the creation of the Common Market and the accompanying increase in trade, together with the increasing demand for oil from the industries of Ruhr and Rhineland areas, the Rotterdam Municipal Council gave its approval for the creation of Europoort in November 1957. But by then the original proposal had mushroomed into plans for a vast new industrial site covering a

total area of some 3875 acres, of which 2325 acres were scheduled for rentable sites, 1000 acres for harbours and canals, and about 550 acres for roads, railway lines, and other public works. Although the plan was originally inspired by the expansion in demand for petroleum and its products, the increase in European consumption of iron and steel was accompanied by increasing shipments of ore and a great new steel works is included in the Europoort project.

Work Begins at Europoort

Construction work at Europoort started in June 1958, only seven months after the plan had been officially approved. Before the work on the new harbours could be started, however, 300 concrete wartime bunkers were demolished, and the 154,000 cu yds of concrete they provided were used for stone-walling the harbour slope. Some $2\frac{3}{4}$ million cu yds of soil were used to build the harbour and retaining dykes, and about 37 million cu yds of earth had to be pressure-sprayed on to the area to raise it to the required height, 15 ft above the mean high water level. These figures give some idea of the enormity of the task involved.

The harbours currently being brought into use give access to the New Waterway opposite the Hook of Holland, and they can accommodate vessels up to 70,000-dw tons with a maximum draft of 42 ft. However, in the second stage of the plan this entrance to the harbours will be replaced by a new entrance direct from the North Sea, which will allow

In a recent trial of the petroleum dock facilities, the 74,000-*dw ton Shell tanker "Sitala" discharged* 34,000 *tons of Syrian crude into one of the newly-completed Shell Nederland storage tanks*

vessels of up to 100,000 tons to enter the harbours. The target date for the completion of this work is 1964, but progress will depend on the extent of demand from larger vessels to use the facilities there.

Inland vessels will approach the harbours by a canal which, when it is completed, will terminate between the sites of the blast furnaces of the new steel works and the oil storage installations. Initially, this canal will be connected with the Old Maas via the Hartel Canal, which will be deepened and widened.

The Petroleum Harbours

Both Shell and Caltex are developing oil storage installations at Europoort, and both companies will have their own jetties. Esso is also reported to be planning to construct a terminal in the area.

The 800-ft Shell jetty will eventually be able to handle two 100,000-dw ton tankers simultaneously. The Company's site covers an area of about 370 acres and has room for 100 storage tanks. Initially, however, it has plans for only eleven tanks, each with a capacity of 40,000 tons. Six of

A floating crane working on the final stages of a jetty

them have already been completed and are an impressive sight, standing 75 ft high with a diameter of 170 ft. Oil will be pumped from the tanks to the Pernis refinery $15\frac{1}{2}$ miles away along a 24-in pipeline.

The Caltex installations are being erected on a 280-acre site. The two tanks, which will be completed later this year, are among the largest in the world, each of them having a capacity of 43,000 tons. The crude will be transported to the refinery, some 18 miles away, by pipeline.

Petrochemicals at Europoort

I.C.I. is also planning a major development at Europoort. If present negotiations are completed successfully the Group plans to invest £100 million over the next 10 years in a petrochemicals complex which will be built on a site covering 300 acres.

Another indication of the rapid growth in the demand for chemicals in the Common Market is given by the decision of Esso Nederland N.V. to build a £6 million petrochemicals plant at its refinery at Rotterdam.

Rotterdam–Rhine Pipeline

A project developed in conjunction with the Europoort plan was the Rotterdam–Rhine pipeline. This 24-in line carries crude from Rotterdam to the Deutsche Shell A.G. and Caltex Tankkraft A.G. refineries at Godorf and Wesseling, nr. Cologne. The line is operated by the Rotterdam–Rhine Pipeline Company in which Bataafse Petroleum Mij and Gelsenberg & Mobil Oil Handels-und Transport GmbH both have a 40 per cent interest, and in which the California Texas Co. has a 20 per cent interest.

It runs for over 150 miles from Rotterdam to Godorf and Wesseling, with a 25-mile branch line from Venlo to Wesel where it connects up with the 16-in line running to the Gelsenberg Benzin A.G. refinery at Gelsenkirchen. Initial capacity of the line is 8 million tons year, but with extra pumping stations this can be increased to 20 million tons year if it becomes necessary.

Just how much money the Europoort project will eventually cost is not known with any certainty. It is thought, however, that the cost of basic facilities to the Rotterdam Municipality and the Netherlands Government may be as high as £60 million.

One thing the planners are confident about, however, is that Europoort will be capable of development to cater for all changes in the pattern of trade up to the year 2000.

OIL SEARCH IN AUSTRALIA

Even without the stimulus of the discovery of a commercial oilfield, there is no let-up in the search for oil in Australia. The latest report of the Australian Bureau of Mineral Resources shows that between the beginning of November and the end of February aerial photography was completed of 52,300 sq miles of sedimentary basins in Queensland and 10,000 sq miles over the Great Barrier Reef, off the coast of Queensland.

Other oil search activities included:

Queensland

Cabawin No 1, drilled by Union Oil Development Corp., Kern County Land Co., and Australian Oil and Gas Corp., blew out at 9933 ft when strong gas shows were encountered and fishing operations were needed. A drill stem test on the interval 5270–5484 ft established a gas water contact at Pickanjinnie No 2. This well is located 1 mile south-south-east of Pickanjinnie No 1 which tested 6·5 MMcu ft/day.

In addition geophysical surveys were carried out by the Bureau of Mineral Resources in the Emerald and Winton areas and surveys by Phillips Petroleum Co., Union Oil Development Corp. (with Australian Oil and Gas Corp. Ltd), Associated Freney Oil Fields N.L., and The Papuan Apinaipi Petroleum Co. Ltd.

New South Wales

Gas shows have been reported at 906–910 ft, 1035–1040 ft, 1226 ft, 1769 ft, and 1987 ft at Baulkham Hills No 1, being drilled by Australian Oil and Gas Corp. Ltd, where the last reported depth was 2280 ft. Australian Oil and Gas Corp. Ltd has commenced a seismic survey in the Sydney Basin, and Terrigal No 1, being drilled for J. Strevens and Associates, was last reported to be drilling ahead at 1590 ft.

South Australia

After a lull in oil exploration activities in the State, a stratigraphic test well was spudded-in early in February at Penola in the south-east of the State by Oil Development N.L.

Western Australia

Following geophysical surveys in the Hill River–Dongara area, West Australian Petroleum Pty Ltd was preparing to drill a deep stratigraphic test well in the Eneabba area, the first ever in the Perth Basin. The Company announced that its first survey lines in 1961 would be run near Cashen Well, where it struck oil seven years ago.

Northern Territory

Spirit Hill No 1, the deepest stratigraphic test to be drilled in the Territory, drilled by Westralian Oil Ltd, was completed at a final depth of 3003 ft.

Papua–New Guinea

Iehi No 1 well was drilled to a final depth of 10,042 ft. Formation tests did not indicate any show of oil. A test of a sandstone below 4708 ft gave a gas flow rate of 31 MMcu ft/day. The well has been abandoned. In the Gulf of Papua, Camelot Nominees Pty Ltd is undertaking a marine gravity survey as an initial step in the exploration of its offshore tenement area.

Victoria

Port Campbell No 2 has been abandoned, and Port Campbell No 3, also being drilled by Frome-Broken Hill Co. Pty Ltd, has been spudded-in 4½ miles north-west of the No 2 well.

FIELDS CO-OPERATION BETWEEN IRAQ AND IRAN

It was announced recently in the Baghdad newspaper *Akhbar* that the Iraqi Council of Ministers had decided to co-operate with Iran in producing the Naftkhanah field. The Ministry of Oil had previously submitted a detailed report on this subject to the Council. The following facts were included in the report.

The Naftkhanah field lies across the border between the Iraqi territory known as Muhawallah and Iranian territory, and is divided into two parts by the river Aby Naft, the Iraqi part being called Naftkhanah field and the Iranian, Naftshah. The area containing oil is 8½ miles long and 1¼ miles broad, whilst the area of the reservoir in the Iraqi part is estimated at about 55 per cent of the total.

Exploitation of the field started in 1927, and thirty-six wells have been drilled in it—twenty-four in Iraq and twelve in Iran. Of the wells drilled in Iraq, three are producers. However, only one well is at present exploited for the Wand refinery in Khanaqin. The Iranian side can utilize five production wells, two of which have been drilled since the termination of Khanaqin Oil Co.'s concession in Iraq.

At present Iraq produces 5000 bd from the field while Iran produces 6000 bd. The expansion and improvement programme which is being carried out in the Iranian part will enable its production capacity to be raised to 25,000 bd in about two years hence.

According to information available, the present reserves of the field recoverable by natural processes are estimated at nearly 22 million tons. This can be increased by using secondary recovery methods.

Iraq felt that since production is from one common reservoir the increase of Iranian production would be at the expense of Iraq's share of the field's reserves.

Maintenance of reservoir pressure and increases in production capacity could not be carried out perfectly except by co-operation between Iraqi and Iranian authorities and agreement between them on a programme for production from the field, which is considered to be one field with Iraqi and Iranian parts.

The Iraq Ministry of Oil, therefore, deemed it advisable to enter into negotiations with Iran on the subject, and proposed that the negotiations should aim at agreement on the following bases:—

1. Exchange of information regarding the two parts of the field. (Iraq claims it had had no information from Iran since the nationalization of Naftshah field in 1952).
2. Exchange of monthly visits between the director of Naftkhanah field and the director of Naftshah field at a place to be agreed upon.
3. Reaching an agreement on assistance from each of the two sides in emergencies such as fire, well explosion, etc.
4. Agreement in principle on making a joint study to discuss the possibility of injecting water into the oil reservoir or adopting any other technical method to increase oil production and maintain the field pressure.
5. Making efforts to reach principles which can lead to sharing production in accordance with fair oil industry practice.

The Iraq Ministry of Oil believes that any increase of the field's production should be effected gradually, especially during the period required to complete its expansion programme, to derive the optimum benefit from the field's production. Iraq's expansion plans requirements will be about 1¼ million tons/year.

Books and Films

The Esso Petroleum Co. in 1960

The Esso Petroleum Co., Ltd enjoyed a 9 per cent increase in volume of sales during 1960, but selling prices were generally lower and overall trading receipts rose by only 6 per cent. With total trading receipts of £309,585,000 the Company achieved a net profit of £11,636,000, an improvement of £694,000 over 1959. These figures are given in the Company's *Annual Review 1960*.

All the Company's major products achieved improved sales in 1960, and, as in 1959, it was fuel oil for industrial users which showed the most substantial increase. The *Annual Review 1960* also records that during the second half of the year the Company was able to meet inland demand for its normal fuel oils from its own refineries.

It contains a colourful pictorial record of the Royal opening of the Milford Haven refinery by the Duke of Edinburgh, and states that from late September to the end of the year the refinery ran nearly 1 million tons of crude.

At the Fawley refinery, there was a record throughput of 11 million tons of crude. Major developments there during the year included the completion of a plant to manufacture special ingredients for lubricating oils and the beginning of construction work on plants to increase output of turbo-jet fuel and to produce up to 40,000 tons/year of ethylene for I.C.I.'s new chemical project on Severnside.

The Company's tanker fleet rose by 150,000-dw tons to 1,770,000-dw tons during the year and carried some 12½ million tons of crude from the Middle East. It has four 47,000-dw ton and five 77,000-dw ton tankers on order, and when this building programme is completed by the end of 1963 none of the Company's ocean-going vessels will be more than 10 years old.

Dealing with the Company's marketing arrangements, the booklet states that in a reorganization of its marketing organization the thirty-one marketing districts were merged into sixteen branches and that it virtually completed its plan to appoint authorized dealers, thereby eliminating the need for many small deliveries to many scattered points.

In the field of research, one of the highlights of the year was the completion of a pilot plant test programme on the injection of fuel oils into blast furnaces. The oil is used in conjunction with coke and gives increased efficiency with decreased costs. Research costs to the worldwide Esso Group are reported to have been nearly £25 million in 1960.

The *Esso Annual Review* 1960 gives an excellent account of the Company's operations in all fields during the year. It is extremely well presented and most colourfully and effectively illustrated.

Shell in North America

Although the Shell Oil Co. in the U.S.A. enjoyed record sales in 1960, the Annual Report for the year shows that net income dropped by 1·9 per cent to $144,588,000. The Company's total crude oil production rose by 1 per cent to average 370,000 bd.

Exploration activities continued on an intensive scale. The number of exploratory wells drilled reached 166, of which 49 resulted in oil or gas discoveries. Of 804 development wells drilled, 102 were dry. In the early part of the year, the Company acquired 34 offshore tracts totalling 178,151 acres in Texas and Louisiana, and from one 5000-acre tract in Louisiana five wells are producing 1200 bd.

The Company's sales of natural gas increased by 18 per cent during the year, and several gas discoveries in Texas promise to result in substantial additions to its reserves. Throughput at the six Shell oil refineries rose by more than 4½ million brl to 183,377,000 brl, and they are now operating at 85 per cent of rated capacity.

Shell Oil Co.'s associated companies in the United States also enjoyed a satisfactory year. Shell Chemical Company achieved a record sales revenue which was slightly ahead of the 1959 level, and among the new products which it started manufacturing during the year was a new phosphate insecticide. The Shell Development Company's research projects included the discovery of an effective new metal-free additive for engine lubricating oil.

During 1960, Shell Oil Co. of Canada Ltd completed its purchase of North Star Oil Ltd, in which it now holds all the voting shares. This added a 12,000 bd refinery at Winnipeg and a 2500 bd refinery at Grand Prairie, Alberta, to its manufacturing facilities. Throughput at all four of its refineries during the year reached 31,876,000 brl.

The Canadian company's sales reached 34,358,000 brl for the year. At the end of 1960 it held some 22 million acres of land under lease, reservation, and permit, and its net reserves of crude oil, gas, and condensate were estimated to be equivalent to over 200 million brl.

Gulf Oil Corporation's Record Year

Gulf Oil Corporation earnings in 1960 rose by $39,844,067 to a new record level of $330,310,825. These figures are contained in the Corporation's Annual Report for 1960, which also records that its crude oil production, which averaged 1,463,528 net bd, was higher than ever before. Production in the United States was 3·4 per cent higher, and, with the exception of Sicily, production was also above 1959 level in all overseas countries in which the Corporation had producing wells.

Over 800 net development wells were drilled during the year, compared to 1089 in 1959, in over 270 individual fields. Nearly 90 per cent of them proved to be commercial oil or gas producers.

The Corporation's production and sale of natural gas exceeded more than 100,000 cu ft/day for the first time. Crude processed at Gulf refineries and on its behalf also reached a record level—759,000 bd.

The report also records an expansion in the Corporation's petrochemicals operations for the eighth successive year, with product sales 29 per cent higher than in 1959.

Practical Training of Production Engineers

The Institution of Production Engineers recently published a booklet entitled "Practical Training in Production Engineering". Adequate and appropriate practical training is one of the three essential requirements for membership of the Institution, and this new booklet re-states the basic principles governing such training.

The Institution hopes that eventually there will be approved training schemes which will meet its requirements in much the same way that certain academic qualifications carry exemption from its membership examination. With this in mind, the booklet is being circulated to industrial training officers and principals of technical colleges.

Copies of the booklet are available free of charge from the headquarters of the Institution at 10 Chesterfield Street, London, W.1.

Opportunities for Qualified Men

The 1961 edition of the Directory of Opportunities For Qualified Men lists over 140 companies who require qualified staff. The main demands are for mechanical engineers, physicists, electrical engineers, and chemists. It includes a series of graphs based on the Index of Executive Employment which gives an analysis of the demand for executives. It also contains an extensive list of courses for qualified men and women and executives.

Information about the size of the organizations, whether men or women are employed, and the areas in which employment is offered, is summarized in tabular form.

The directory is being distributed free of charge to newly qualified men and women, but it can also be purchased price 8*s* 6*d* (9*s* 3*d* by post) from Cornmarket Press Ltd, Darley House, 1 Lower James Street, London W.1. A paperback edition is also available, price 5*s* 0*d* (5*s* 7*d* by post).

U.S. Conference on Weights and Measures

The report of the 45th National Conference on Weights and Measures held in Washington D.C., 6–10 June records the full proceedings of the Conference including papers delivered by delegates, and committee reports. It can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., price 75 cents plus one-fourth to cover mailing costs.

This Is United Steel

Described as a general review of The United Steel Companies Ltd, this must be one of the most comprehensive introductions to a company published in recent months.

The United Steel Companies Ltd was formed in 1918 by the amalgamation of a number of iron and steel works. To-day the group produces one-eighth of Britain's steel and employs over 38,000 people. It markets a wider variety of steel products than any other British company.

The book contains well-illustrated descriptions of various companies in the group. It also gives details of share and loan capital, as well as output figures of the main products.

The Problem of Laid-up Tankers

Westinform Shipping Report No 174 compares laid-up tanker tonnage to-day with the position a year ago. It shows there have been changes not only in volume but in composition. By the end of 1960 the total of unemployed tankers had fallen below 3½ million-dw tons for the first time since April, 1958. Twelve months earlier it had exceeded 5 million tons.

The current survey includes analyses of the laid-up fleet at 7 January 1961. The T2 type of ship is shown to have been brought back into service in considerable numbers during 1960, though not as readily as postwar tankers have been. The number of T2's laid up has also been depleted by scrapping. A size group analysis demonstrates the ability of tankers greater than T2 size generally to avoid lay-up. Of all laid-up tankers, 56 per cent had been laid up before the middle of 1959 and had been out of action throughout two winters, while many had been idle for three. Although not all these vessels are necessarily destined not to trade again, opportunities will be restricted.

The report ends with an examination of the trades entered by tankers re-activated during the last three months of 1960. This shows a concentration of Black Sea and Caribbean loadings and a comparative absence of opportunities in the Persian Gulf, reflecting the predominance of the smaller sizes of vessel emerging from lay-up.

Copies of the report may be obtained from W. G. Weston Ltd, 26 Cockspur Street, London, S.W.1 at a cost of £2 each (postage extra).

British Standards

Fusion welded pressure vessels: Carbon and low alloy steels

The publication of these extracts from BS 1500, Part 1 in the form of BS 1500A: 1960 has been made in response to requests for those parts dealing with manufacture, workmanship, inspection, and testing of pressure vessels to be produced in a handy and convenient form.

The contents of this publication include the whole of Sections Four and Five, and Appendix A of BS 1500, Part 1: 1958, together with the relevant illustrations and other appropriate information.

Copies may be obtained from the BSI, Sales Branch, 2 Park Street, London, W.1, price 12*s* 6*d*, (postage extra to non-subscribers).

Oil suction and discharge hose

BS 1435: 1960. This revised British Standard titled *Oil suction and discharge hose with built-in end connexions for test pressures of 100, 150, 200 and 1225 psi*, deals with requirements for lightweight hose. The types of oil suction and discharge hose specified are those commonly used for transferring liquid petroleum products to and from tankers and bunkering vessels.

Details of hose construction are less rigidly defined than in previous editions of the standard, as it is felt that such detailed specifications might hamper the introduction of improved materials or methods of construction. A further change is that no reference is made to the hose working pressure: instead, hose is classified by factory test pressure and it is left to the user to determine the appropriate working pressure.

The test requirements have been altered in some respects; in particular, the hydrostatic pressure to be applied in the production sample test has been increased from three to four times the factory test pressure for finished hose. In addition, hose previously rated at a working pressure of 250 psi has been reduced to a factory test pressure of 225 psi and a new criterion of hose elongation has been introduced.

Copies of the Standard are priced 7*s* 6*d*, plus postage to non-subscribers.

ECAFE MEETING IN BANGKOK

The proposal to hold a second symposium on the development of the petroleum resources of Asia and the Far East in Tehran in 1962 has been adopted by the Committee on Industry and Natural Resources of the Economic Commission for Asia and the Far East, which met in Bangkok recently.

The Committee also discussed the question of setting up a Regional Petroleum Institute for the training of technical personnel required by countries in the ECAFE region in the petroleum industry and for co-ordination of research.

Mr Bagher Mostofi, a member of the Board of NIOC, reiterated the Iranian Government's proposal to the effect that the Regional Petroleum Institute should be established in Iran; a view which received support from representatives of other member countries.

Trade Literature, etc.

Contracts for New Portuguese Fertilizer Project

Engineering of the ammonia and urea plants for a new fertilizer plant being erected at Barra a Barra, Portugal, by Uniao Fabril do Azoto of Lisbon will be carried out by The M.W. Kellogg Company and Kellogg International Corporation, London, who will also handle the procurement of materials in the U.K. Kellogg of Panama will be responsible for procuring materials in Portugal and will carry out all construction except administrative buildings.

Engineering and procurement for the nitric acid plant, the ammonium nitrate plant, and the nitro-limestone plant will be undertaken by C & I Girdler International Ltd of Nassau, Bahamas.

Aeromagnetic Survey of the English Channel

Hunting Surveys Ltd is to conduct an airborne geophysical survey over the western English Channel, Isles of Scilly, and Lundy, and a sea area south-west of the Bristol Channel on behalf of the Department of Scientific and Industrial Research. The survey is part of a programme being undertaken by the Geophysical Survey of Great Britain and will be magnetically tied into the previous airborne magnetometer survey over Devonshire and Cornwall carried out by the same firm for the Geological Survey.

The navigation and position fixing over sea areas will be controlled by the Decca Navigator network. The work involves flying some 14,000 line miles of magnetic profile.

Power Plant Manufacturers Pool Resources

The General Electric Co. Ltd and Richardsons, Westgarth, & Co. Ltd are to pool their resources for the design, development, sales, and manufacture of heavy electricity generating and industrial power plant. Plant manufacture will be shared and initially based on current G.E.C. designs. Richardsons, Westgarth will concentrate on the design of industrial power plant to supplement G.E.C. designs.

New Maleic Anhydride Plant for Italy

Bombrini Parodi-Delfino S.p.A., has awarded an engineering contract to Scientific Design Co., Inc, for a maleic anhydride plant to be built at Colleferro, Italy. The plant will have a capacity of 10 million pounds/year, and is due for completion in the middle of 1962.

News from Alenco Companies

The British Ermeto Corp. Ltd's new hose catalogue includes details of a new range of balanced stop valves. One of the Company's associates, Simplifix Couplings Ltd, has introduced a nylon tube coupling utilizing a standard Simplifix coupling body, but using a specially designed olive and nut which prevents the tube twisting when the joint is made.

Flexible Couplings

Aero Controls Ltd is marketing three new types of flex coupling which, although intended normally for use in fuel, hydraulic, pneumatic, and lubrication systems, can also be adapted for use with corrosive fluids. Their chief feature is that they permit both axial and angular deflection of the pipes and a misalignment of up to 1/16 in is acceptable when fitting, making expansion joints in the system unnecessary. They comprise a screw-type with "O" ringseals, mainly for aeronautical applications, a lightweight version with a twin beaded seal suitable for both aircraft and commercial systems, and an industrial design for heavy duty applications.

Chemico Awarded Mexican Contract

Chemical Construction (G.B.) Ltd is supplying full process design and detailed engineering services relating to a 30 short tons day sulphuric acid concentration plant of the submerged combustion type which is to be erected in Mexico by Compania Mexicana de Explosivos, S.A.

New Range of Sump Pump

Worthington-Simpson has now developed its range of type "D" pumps for sump duties covering capacities up to 330 gpm and heads up to 210 ft depending on capacity. The pumps will handle a wide variety of acids, alkalies, and slurries. Certain pumps will also deal with liquids containing solids up to $\frac{1}{2}$ in diameter, and viscous as well as clear liquids.

High-Purity Mercury

Two grades of mercury are now being offered by Johnson Matthey for laboratory and industrial use. Redistilled mercury has a maximum impurity content of 5 parts per million (mostly copper and silver) and triple-distilled mercury a maximum of 1 part per million.

The product is described in a newly issued data sheet in the Electrical Engineering series, 1300:492. It is available from the Company at 73–83 Hatton Garden, London, E.C.1.

Diamonds for Project Mohole

Diamonds with an estimated value of £10,000 and a total weight of about 3000 carats have been donated to "Project Mohole" by Industrial Distributors (1946) Ltd, a subsidiary of De Beers Consolidated Mines. The 9-in drilling crown shown in this photograph contains some 2500 diamonds, and will be used in the project to cut a $1\frac{3}{4}$-in core for study and analysis.

Electric Furnaces

Metalectric Furnaces Ltd has issued a booklet illustrating some of the melting and heat treatment processes in which the Company's furnaces are used. Copies of the booklet are available from the Company at Cornwall Road, Smethwick 40, Staffs.

Electrical Resistance Furnaces

Johnson Matthey has issued a revised and enlarged series of data sheets, the 1740 series, describing its range of platinum-wound electrical resistance furnaces and control units.

The full range of JMC furnaces includes eight general-purpose furnaces with cylindrical combustion chambers and three with rectangular combustion chambers, for maximum operating temperatures of 1350 –1500 C, as well as the newly introduced type K45F, primarily intended for the determination of the fusion points of coal and coke ash by the method described in BS 1016: Part 15, and the TK2 thermocouple calibration furnace at up to 1775 C. The largest rectangular combustion chamber available in the range measures 12 in x 6 in x 5 in.

The data sheets are obtainable free of charge from the Company at 73–83 Hatton Garden, London, E.C.1.

U.S. Company's Polyethylene Resins

Phillips Petroleum International Corporation reported recently that it is now selling its brand of polyethylene resins in 34 countries. Exclusive production and marketing rights have been granted to a number of firms in other countries, including British Hydrocarbon Chemicals Ltd in the U.K.

Perkins Diesel Powers the Jeep

The new Perkins *Four 192* diesel engine is now being offered as an option in three export models of the 4-wheel drive "Jeep" vehicle of Willys Motors, Inc, of Ohio.

The engine develops 62 hp at 3000 revs min and has a 192·4 cu in piston displacement. Maximum torque is 143 ft-lb at 1350 revs min.

Hydraulic Oil Filter

Aircraft Porous Media Inc of New York claims that its *Triphane* filter assembly can filter hydraulic and other petroleum-based fluids and water, to absolute 3-micron cleanliness at rates up to 170 gpm continuous flow.

The heart of the unit consists of a combination fibreglass membrane primary throwaway cartridge followed by a *Rigimesh* corrugated sintered woven wire mesh filter element which provide 98 per cent 5-micron filtration and absolute 18-micron filtration. Housings are made of stainless steel and are rated at 125 psi.

New Address for FBRAM

The Federation of British Rubber and Allied Manufacturers has moved its offices to 19/20 Berners Street, London, W.1.

Noble Metal Thermocouples

A third edition of "Noble Metal Thermocouples" by H. E. Bennett, F.I.M., has been published by Johnson Matthey. It describes the development, applications, and methods of calibration of the Noble metal thermocouple. Curves of temperature against emf are given for many types of couple incorporating alloys of the platinum group metals, and a chapter describes the chief causes of deterioration in service.

The book is available free from Johnson, Matthey & Co. Ltd, 73-83 Hatton Garden, London, E.C.1.

New Audco Valves

The latest range of Audco valves have polytetrafluorethylene taper sleeved plugs.

PTFE is inert, relatively hard, has an extremely low coefficient of friction and is resistant to all chemicals except fluorine and the molten alkali metals. The use of this material in a plug valve is claimed to eliminate the risk of galling and sticking due to metal to metal contact. It is said to result in a valve which is leakproof, has a remarkably low turning effort, and a considerable resistance to chemical attack, besides being virtually maintenance free. The manufacturers are Audley Engineering Co. Ltd who recently changed their name to Audco Ltd.

SITUATIONS VACANT

Chemists required at Headquarters, **Ministry of Aviation,** London.

Post 1. Take charge of section responsible for initiating and progressing research programmes to provide hydraulic fluids and aircraft lubricants of improved performance and prepare and maintain specifications for these materials.

Post 2. Initiate and control extramural research and development programmes connected particularly with use of paints and adhesives in aircraft and guided weapons; deal with problems arising from use of these materials and prepare and maintain specifications for these materials.

Post 3. Initiate and control extramural research and development programmes connected with use of plastics in aircraft and guided weapons, deal with problems arising from the use of plastics and prepare and maintain specifications for plastics for use in these fields.

Appointments as **Principal Scientific Officer** (min. age 31) or **Senior Scientific Officer** (min. age 26). *Quals.:* 1st or 2nd class honours degree, or equiv., in chemistry and some years' post-grad. research exper. in appropriate field. *Salary ranges:* P.S.O.—£1,781–£2,384; S.S.O.—£1,402–£1,719, superannuation under F.S.S.U. Opportunity for candidates under 31 to compete for established (non-contributory pensionable) posts. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King Street, London, S.W.1., quoting ref. F.263/1A and appropriate post. Closing date 29 June 1961.

The Kuwait National Petroleum Company requires the services in Kuwait of a **Chartered Accountant** (age 30/35 years) to supervise their Products Distribution Division. First-class experience in general accounts essential: 2/3 years in petroleum products distribution accounts in an executive capacity, including general financial experience, is desirable. Commencing salary will be from £225 to £250 monthly, depending upon qualifications and experience. Annual increments by £250 per annum to £4000. Free furnished air-conditioned married accommodation, together with adequate allowance for water and electricity. There is no income tax on personal incomes in Kuwait. Annual leave at the rate of four days for each calendar month of service after completion of first year, which will be the probationary period. First-class air passages for employee and family, including holiday travel.

Written applications should be addressed to the Kuwait Agency, 40 Devonshire Street, London, W.1., giving details of nationality, age, qualifications and experience, together with names and addresses of three referees. Interviews will be held in London.

SERVICES AVAILABLE

Drawing office design and tracing capacity available for piping, electrical and instrumentation installations for oil refineries and similar plants and projects. All work supervised by competent experienced engineers, apply by telephone Lee Green 3416 or write Wellen (Engineers) Ltd, 89 High Street, S.E.13.

PATENTS FOR SALE

Patent No: 791,343 entitled "Improvements in or relating to Greasing Nipples" is for sale or licence. For details apply to Chatwin & Company, Chartered Patent Agents, 253 Gray's Inn Road, London, W.C.1.

FOR SALE

WATERFOG and Waterspray Installations, automatic or non-automatic, designed and installed for Fire Fighting. Also complete Foam Installations. Fire Armour Limited, 9 George Street, London, W.1.

UNIVERSITY OF BIRMINGHAM

DEPARTMENT OF CHEMICAL ENGINEERING

Postgraduate Courses

One-year courses are available in the department as follows:—

M.Sc. (Chem. Eng.)
M.Sc. (Chem. Eng.) in Biochemical Engineering
Diploma in Chemical Engineering
Diploma in Petroleum Production Engineering

Applicants for admission to the M.Sc. courses are expected to hold a good Honours degree, or an equivalent qualification, in Chemical Engineering with, preferably, some suitable industrial experience.

Entry to the Diploma Courses requires, normally, a good degree or equivalent in an appropriate science e.g. chemistry or mechanical engineering for chemical engineering and civil, mechanical, mining or geology for petroleum production engineering. Graduates in physics and mathematics would also be considered.

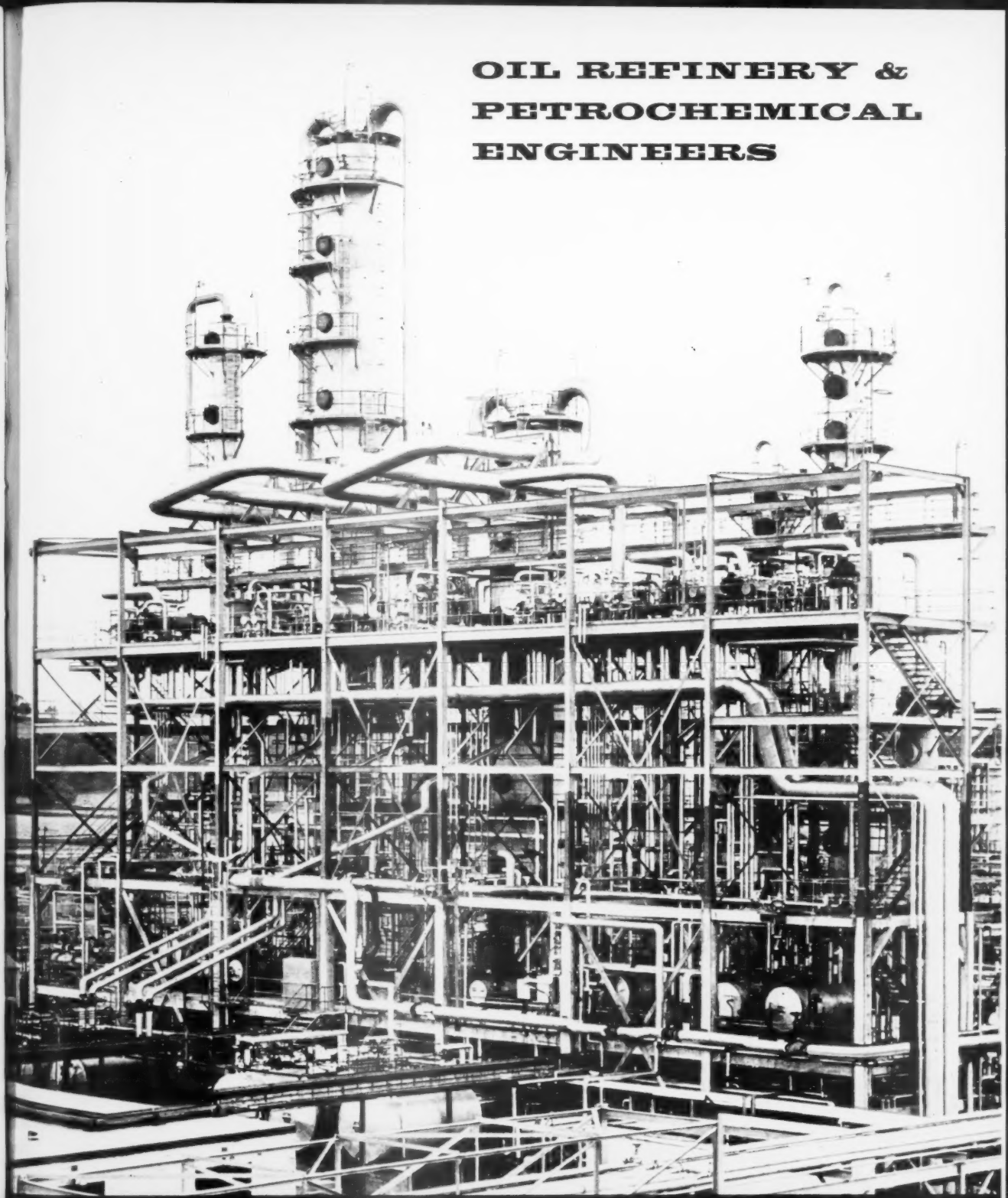
M.Sc. (Chem. Eng.)
The course, instituted in 1957, consists of postgraduate lectures, with tutorials, in selected fields of fluid flow, heat transfer, reaction kinetics and reactor design and chemical engineering mathematics (with statistics) together with training in research methods in the form of an individual research project of limited scope.

M.Sc. (Chem. Eng.) in Biochemical Engineering
The course, instituted in 1957, covers the application of chemical engineering in processes involving micro-organisms, effluent disposal, preservation of biological materials, etc. A short individual research project is undertaken in addition to the lecture courses.

Diploma Course in Chemical Engineering
This course, first given in 1951 but remodelled in 1955 as a self-contained course of lectures, tutorials, laboratory and design problem work covering the unit operations and processes. Success exempts from the examinations of the Institution of Chemical Engineers. (It is probable that this course will be discontinued from September, 1962.)

Diploma Course in Petroleum Production Engineering
This course, to be instituted in October, 1961, is intended to give students theoretical and practical training in Reservoir and Field Production Engineering and will extend over one year. The presentation of a report on some aspect of Petroleum Production Engineering will be an essential part.

The Department of Scientific and Industrial Research has accepted the above chemical engineering courses as suitable for the tenure of its Advanced Course Studentships. Application should be made in the first instance to the Registrar, The University, Edgbaston, Birmingham, 15, from whom information regarding fees, residence, etc., may be obtained.



OIL REFINERY &
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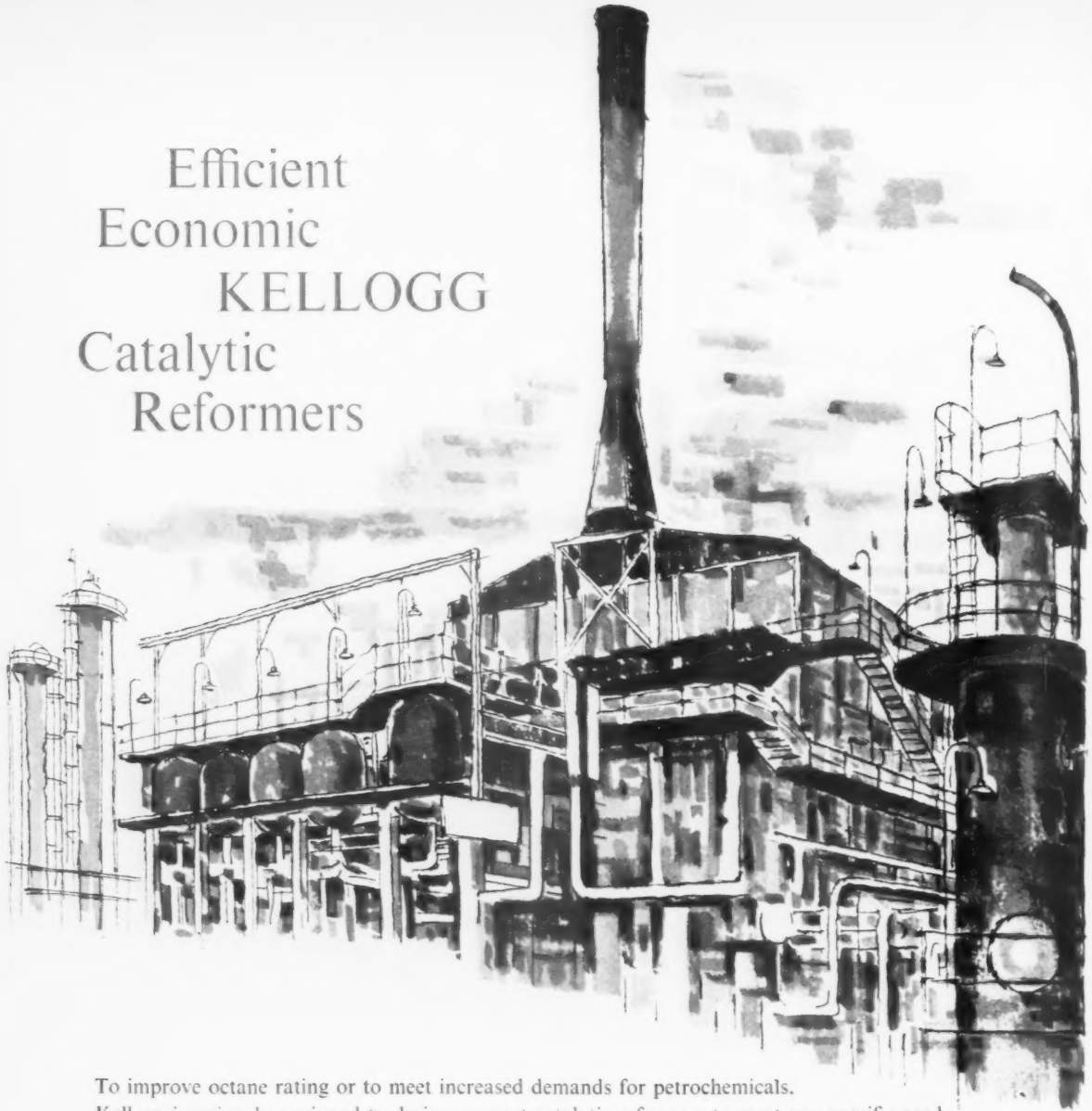
ENGINEERS

MATTHEW HALL

& CO. LTD.

Efficient Economic KELLOGG Catalytic Reformers



To improve octane rating or to meet increased demands for petrochemicals.
Kellogg is uniquely equipped to design or erect catalytic reformers to meet any specific need.
Combined with Kellogg-designed hydrotreating facilities, cat reforming produces high octane gasoline of superior quality. The reformate is also a rich source of aromatics for petrochemical production.
Feedstocks reformed include light, heavy and full-boiling virgin naphthas as well as thermally and catalytically cracked stocks which have been selectively pretreated. Products include aromatics such as benzene, toluene, and xylenes plus isobutane and hydrogen.
Kellogg International Corporation has extensive experience in catalytic reforming, drawn from a total of 40 commercial installations having a combined throughput of close to 350,000 B.P.D.
For further information send for the booklet "Regenerative Catalytic Reforming".

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Kellogg International Corporation

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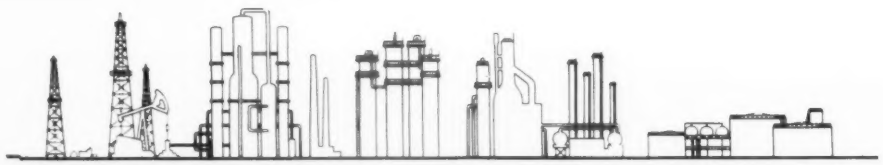

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Airlift Australia

AUSTRALIA'S Snowy Mountains Scheme has presented some unusual challenges to BP as sole supplier of petroleum products. Some of these challenges have been met in unusual ways, such as fuel drops from aircraft.

This gigantic project, midway between Sydney and Melbourne, with its great dams, power stations, and miles of tunnels and aqueducts, is designed both to provide hydro-electricity and to divert irrigation water westwards into the parched plains.

British Petroleum is proud to be associated with the Snowy Mountains Scheme, one of the world's greatest engineering undertakings.

BP

Then and now:
An artist's impression
of Drake's well and of a modern
offshore drilling rig.

A HUNDRED YEARS OF TUBE MAKING

In 1859, at the time Drake's well was being drilled in Pennsylvania, U.S.A., the founders of Stewarts and Lloyds were already making steel tubes in Britain. Now, with a hundred years of experience behind them, S & L are one of the largest manufacturers of steel tubes in the world.

The Company's products, used in oilfields and refineries throughout the world, include oil well casing, tubing and drill pipe, line pipe, fabricated pipework, butt-welding fittings and various types of carbon and alloy steel tubes required for oil refinery and chemical plant.

HOLDERS OF A.P.I. PIPE LICENCE NO. 1

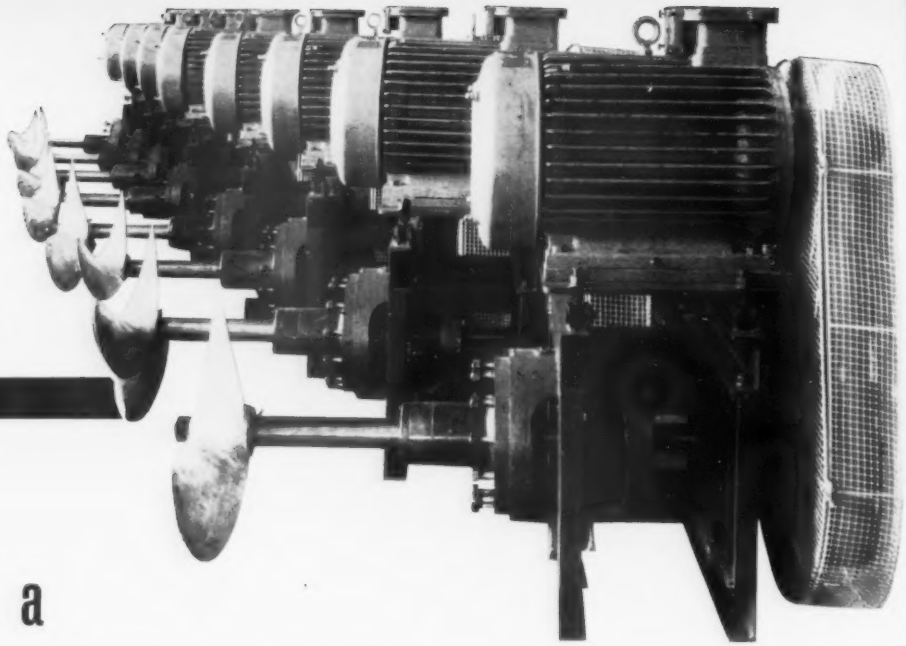
Stewarts and Lloyds were the first manufacturers in the world to be licensed by the American Petroleum Institute to apply the A.P.I. monogram to their oil country tubular goods.

Enquiries should be addressed to

S&L

STEWARTS AND LLOYDS LIMITED

'O' Department, 8 Gough Square, Fleet Street, London, E.C.4

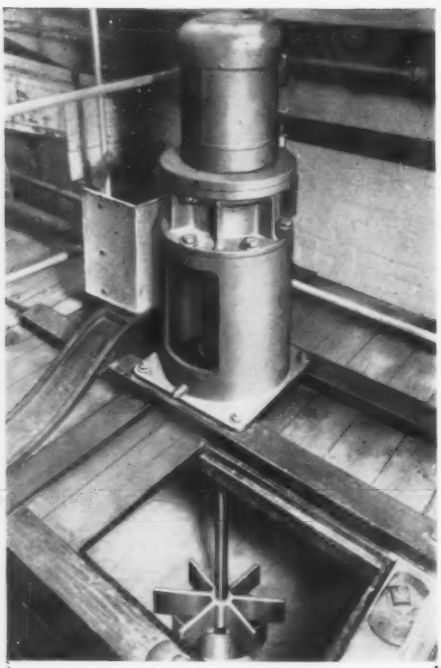


Battery of large Side-entry Petroleum blending agitators for despatch to a Middle East Refinery.

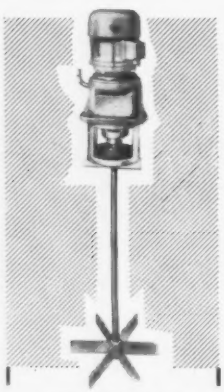
There's a MITCHELL MIXER

for every industrial need

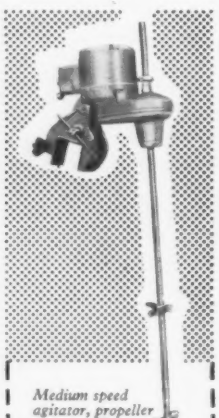
Whether your problem is oil blending, addition of additives, incorporation of the fats and greases, grease mixing or chemical mixing in reaction vessels on batch or continuous basis it will pay you to consult



GVD type medium speed fluid mixer fitted with open type turbine impeller and stabiliser ring for oil and grease blending and for the inclusion of additives into lubricating oils.



Heavy duty 460 r.p.m. permanently mounted fluid mixer with turbine impeller.



Medium speed agitator, propeller type for oils and grease blending.

Variable speed air operated fluid mixer for inflammable solutions.

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fluid mixing specialists

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London Office: PORTLAND HOUSE, 73 BASINGHALL STREET, LONDON, E.C.2

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22-month test proves savings from using

MISSION MUD MONARCH VALVES

OVER 2400 VALVES AND SEATS were used by a large operator during a 22-month test comparing the cost of Mission Mud Monarch fluid end mud pump valves and seats with the competitive make he was using at the beginning of the test. Due to the size and duration of the test, results may be considered conclusive for the 2500-psi pressures and other conditions encountered.

This test showed that Mission Mud Monarch Valves and Seats cost less than half as much per thousand feet of hole as the competitive make.

Why don't you make a competitive test yourself to find out just *how much* Mud Monarch Valves can save *you?* Many operators have reported important savings at normal pump pressures, even though the advantage of using Mud Monarch Valves becomes greater as pressures become higher. Arrange with your Mission Representative for a competitive test.

COMPETITIVE VALVES

cost more than £12 per thousand feet of hole.

MUD MONARCH VALVES

cost less than £6 per thousand feet of hole!

Nothing but the finest will bear the name of

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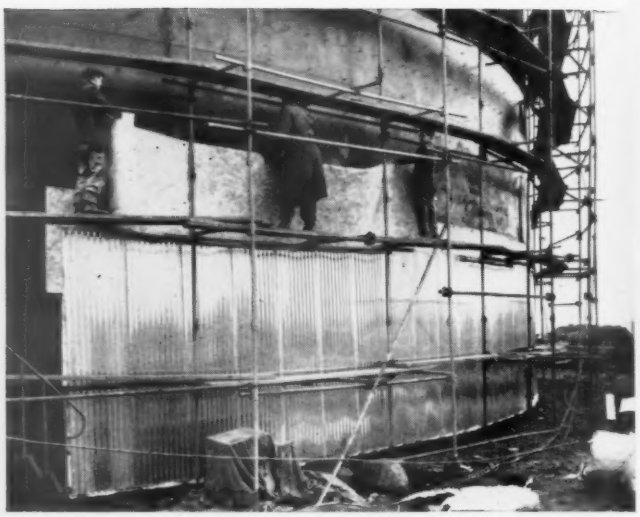
If you want the benefit of ESSO's experience of insulating tanks . . .

LOOK AT THESE TWO PICTURES



They show the method of applying Crown insulation used on the tanks in the new Esso installation at Tynemouth.

First Stud-weld a series of pins to the surface of the tank.

Second Impale Fibreglass Crown insulation on these pins. Because of its high tear strength it will be supported by the pins indefinitely and without sagging.

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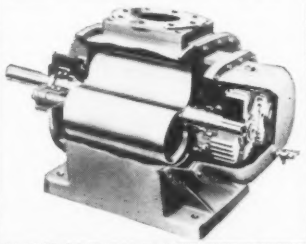

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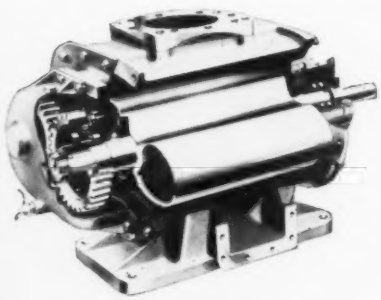

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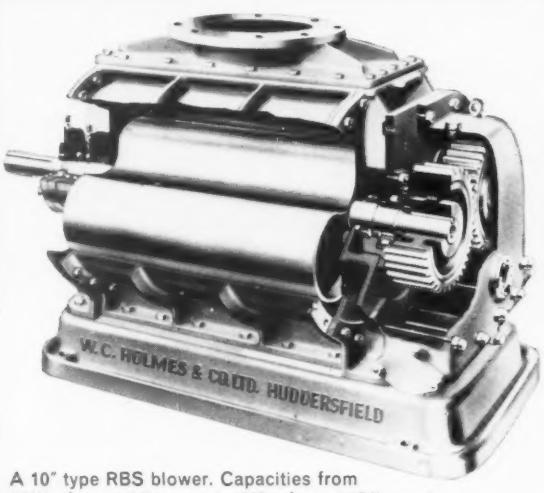

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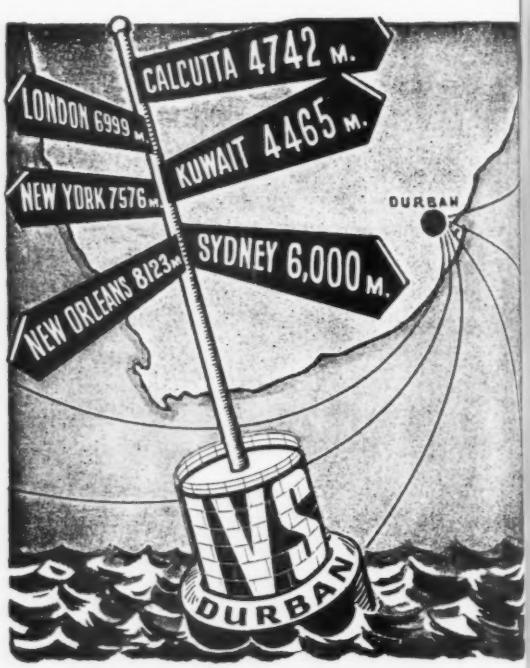

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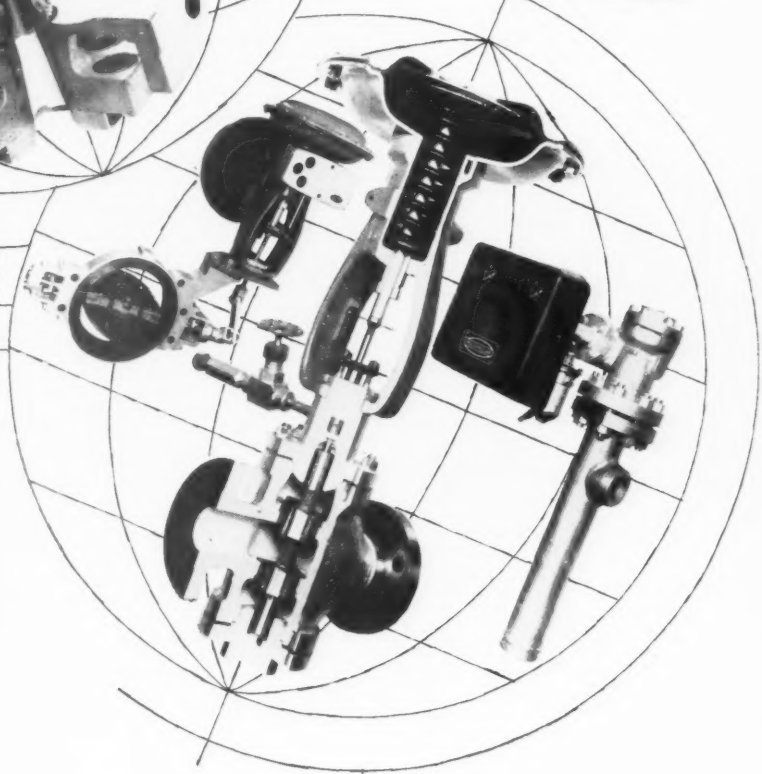

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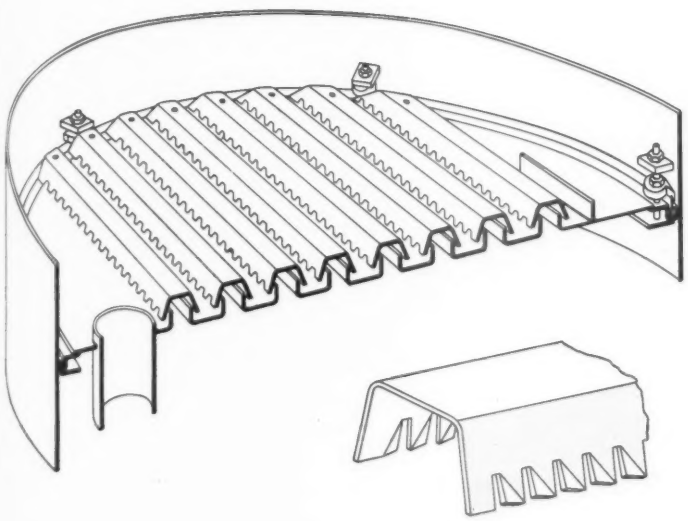

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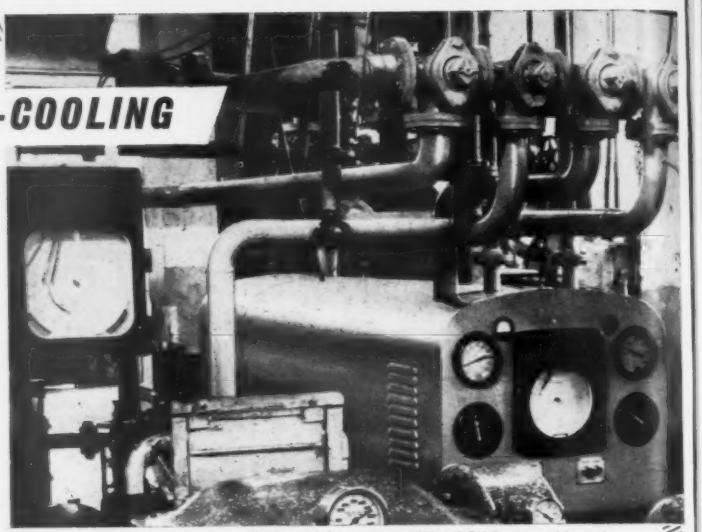

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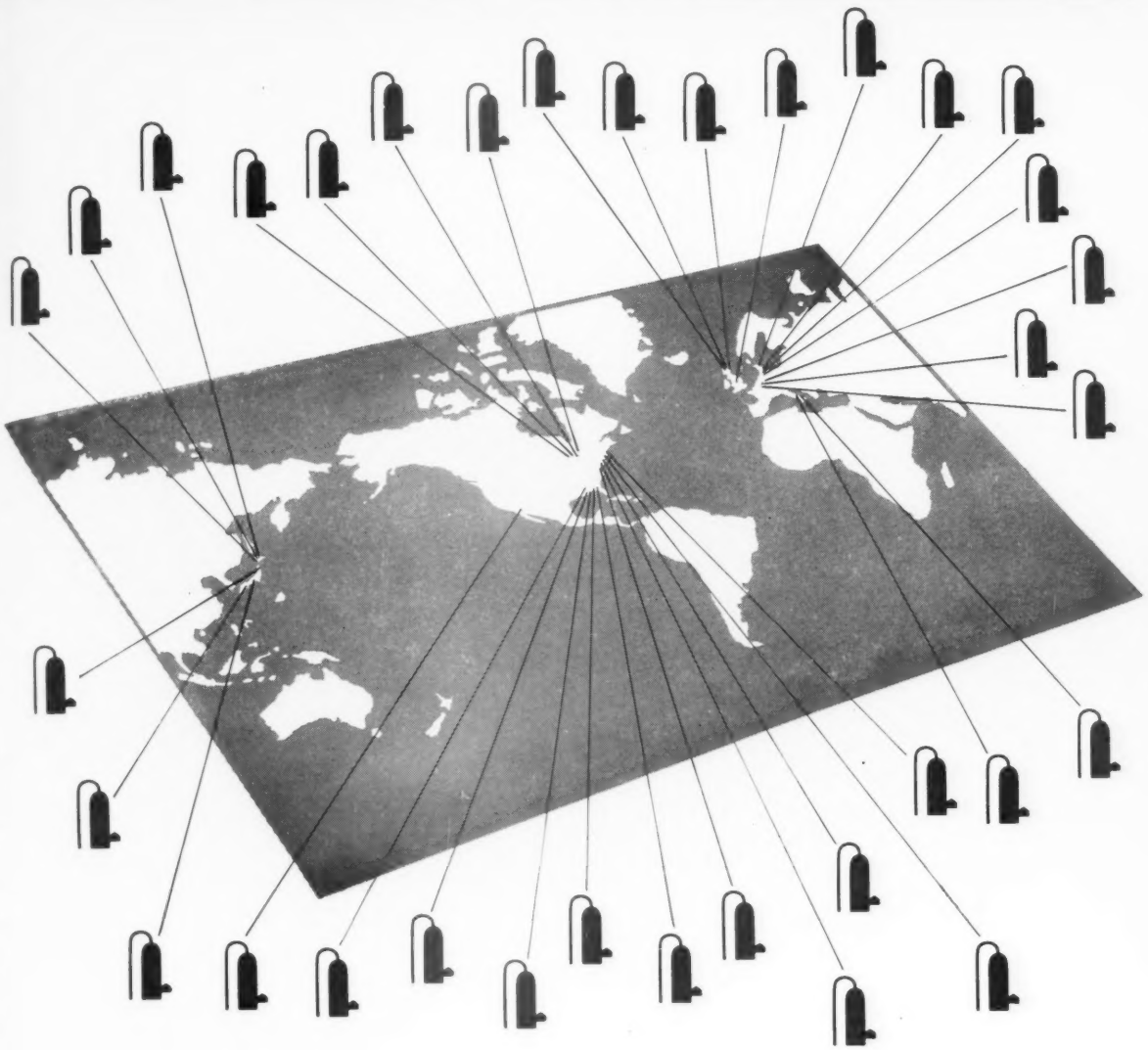

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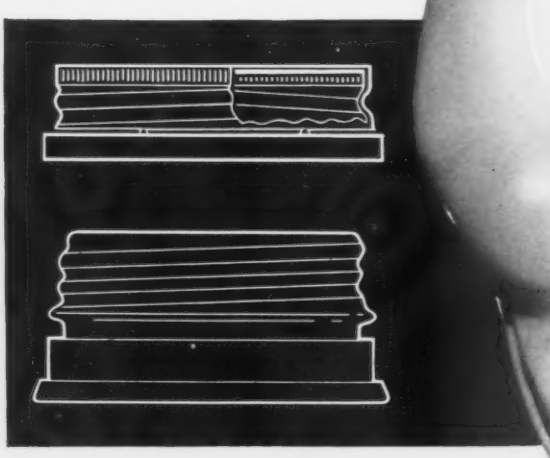

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